INLAND PORT FEASIBILITY STUDY

Project No. 06-023
Tasks 3-5 Draft Report

The Tioga Group, Inc.

Railroad Industries, Inc.

Iteris

Prepared for:

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

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June 5, 2008

Tioga

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Dear Mr. Jones:

We appreciate the opportunity to submit our team's draft deliverable for Task 3-5 of the Inland Port Feasibility Study. This draft is submitted as a working document for review by SCAG staff. We have incorporated some of the questions, comments, and concerns received to date. We look forward to working with SCAG to finalize our work.

Sincerely,

Daniel Smith, Principal and Project Manager

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I. Summary and Conclusions

Project Overview

The purpose of this project was to determine whether and how inland port concepts could be implemented to reduce truck VMT and generate other public benefits in the SCAG region. From project inception through analysis of technical feasibility and potential benefits it was generally anticipated that the answer would depend on technical findings. As the study team progressed through Inland Empire site selection, implementation analysis, and community acceptance issues a very different picture emerged.

Feasibility and Benefits

The study team's overall conclusion is that the inland port/rail shuttle concept is sound and would benefit the region if it could be implemented. Rail shuttle service to the heavily developed central part of the Inland Empire is technically feasible and would reduce net truck VMT. The reductions, however, are not large because the 60-mile rail movement still requires local drayage inland, offsetting the rail savings.

According to port survey results, there are about 3,500 daily truck trips between the Ports and Riverside and San Bernardino Counties combined. Two daily round trip intermodal trains could divert a maximum about 33% of these trips. While analytically significant and a net reduction in congestion, such diversions would not be noticeable to the general public. There would, however, be a noticeable increase in truck activity in the immediate vicinity of the inland port terminal. In the Mira Loma area, where the level of truck activity is already objectionable to some community members and a concern to regional planners, a noticeable concentration of "new" trucking activity would be politically unpalatable.

The net change in truck VMT within the Inland Empire would be small, as most of the VMT savings would be between the Ports and the Inland Empire. Truck trips would be diverted from I-710, I-605, I-10, SR-60, and SR-91. To serve a point in Ontario, for example, a truck trip from the Ports on I-710/I-10 would be replaced by a shorter trip on I-10 (or perhaps on surface streets) from the inland port. Regional truck VMT would decline, but truck VMT within the Central Inland Empire would increase.

The inland port concept faces a paradoxical planning barrier in attempting to serve the existing Inland Empire traffic base. The model results clearly indicate, as expected, that a terminal location in the Mira Loma area would maximize the VMT reductions and generate the most benefits. Such locations are scarce, however, and would also meet the most local opposition. Sites farther from Mira Loma are somewhat easier to find and may be more acceptable to local communities and regional agencies, but would not yield the same near-term VMT reductions.

Implementing Steps

As the Task 1 and 2 report points out, there is no current organization with a charter to develop or run a rail shuttle/inland port service. Advocates would thus face a substantial effort to organize a shuttle service.

Implementing an inland port/rail shuttle system would require several steps, each with significant barriers to be overcome.

Target Markets. The primary near-term geographic market is the Mira Loma area in the Inland Empire. The Barstow and Victorville markets are developing and would be likely candidates for future logistics parks served by inland ports.

Choose and Secure Terminal Sites. The study team identified a small number of candidate sites for Inland Empire terminals serving Mira Loma. Given volatile Inland Empire real estate conditions however, these sites may be committed to other uses on short notice. The SCLA site at Victorville and the open site west of Barstow appear relatively secure but will not remain open indefinitely.

Provide Port-Area Rail Capacity. At the Port end of the system, Pacific Harbor Lines must be able to efficiently gather railcars with eastbound import containers and distribute railcars with westbound empty and export containers. Substantial improvements in the port rail network will be required, eventually over and above current rail improvement plans.

Rail Service Agreement. A rail service agreement in likely to resemble a commuter rail operating agreement. In return for operating payments and capacity funding, the railroad(s) would agree to operate a fixed schedule of rail shuttle trains, or to allow a contractor to do so. The agreement would encompass locomotive and rail equipment supply, operating windows, etc.

Port Area Rail Capability

The port area rail system is not currently capable of efficiently supporting a rail shuttle service. If, as expected, rail shuttle trains must be assembled from multiple on-dock terminals, the process would be slow and costly due to lack of yard capacity and inefficient legacy connections. Besides handicapping a rail shuttle in competing with trucks, force-fitting rail shuttle operations would hinder the assembly and operation of higher-priority long-haul container trains.

The Ports have engaged in ambitious rail improvement planning. Implementation of those plans is stalled however. Delays in rail improvements mean that when new capacity is finally added it will be quickly filled with long-haul business.

Mainline Rail Capacity

If a rail shuttle of any kind is to become operationally feasible, the region will likely need to engage either or both railroads in a partnership to expand rail capacity. The SCAG Region as a whole is experiencing enormous pressure on its rail capacity, creating an implementation barrier for rail shuttle service.

- Growth of container traffic at the ports is rapidly escalating the demand for double-stack rail service.
- The region's domestic economy generates an increasing volume of domestic rail traffic, both intermodal and conventional carload. The domestic intermodal business competes with international intermodal business for terminal capacity as well as main line capacity.
- Growth in commuter and regional rail passenger operations coincides with using freight demand on many lines.

A rail container shuttle between the San Pedro Bay ports and an inland port in the Inland Empire or beyond would therefore have low priority within the region's overall rail needs..

Each container truck on the highway is the congestion equivalent of 2-4 passenger cars, with the higher equivalence corresponding to more congested conditions (as on Interstate 710) or steeper grades (as on Interstate 15 over Cajon Pass). At an average passenger car occupancy of about 1.2, each diverted container trip is therefore the equivalent of diverting 2.4-4.8 commuter trips. The region is presently subsidizing regional and commuter rail passenger service. Whether a rail shuttle/inland port combination can be as effective in reducing congestion as rail passenger service depends on the volume of "customers" each can divert from the highways and the relative subsidies required for each. In terms of VMT avoided, the region would probably be better off using the available rail capacity for longer haul, interstate container movements that might otherwise have been trucked.

Inland Empire Terminal Sites

The window of opportunity for an inland port in the Mira Loma area has closed. There are few remaining sites for a terminal in the immediate Inland Empire (e.g. Mira Loma), and they are going fast. There is vehement local community opposition to an inland port development in the Mira Loma area. With the current scarcity of terminal sites and county priorities for job creation, there is now no realistic opportunity to implement an inland port/rail shuttle concept in the Mira Loma area.

A decade ago there would have been multiple terminal sites, less community sensitivity, and reserve rail capacity. If a rail shuttle had been put in place serving a Mira Loma terminal at that time, that service would have diverted at least some of the port truck traffic that has since developed. While the opportunity might have existed then, the public sector demand for such a solution probably did not. Port trucks were not then viewed as a major source of congestion. While the concept of subsidizing freight operations to reduce congestion is a major implementation barrier now, it would have been an even greater barrier ten years ago.

Current Inland Empire planning priorities do not favor an inland port. As the detailed terminal site discussion indicates, there are few suitable sites remaining in the central portion of the Inland Empire. Regional planning priorities are focused on job creation for the remaining sites. On the basis of jobs per acre, an inland port cannot compete with value-added logistics, conventional distribution centers, manufacturing, or offices. Even though an intermodal rail terminal may be consistent with zoning in some areas, it would not be consistent with local planning strategies.

Should an inland port be proposed for a central site, it is likely to face political, procedural, and even legal challenges from community groups, local jurisdictions, and regional planning agencies.

Beyond the Inland Empire

As future inland port candidates, the key question facing both Victorville and Barstow is the emergence of a market for port container movements. Not every distribution center has a significant volume of port container traffic. Many of the early facilities at SCLA are associated with the aircraft and air transport industry, and others primarily ship and receive domestic goods (or imports that have already passed through another supply chain and are no longer linked to the Ports). While these customers can benefit from a conventional intermodal facility and the transportation options it provides, they would not be customers for an inland port/rail shuttle combination.

For both Victorville and Barstow the question is one of timing. Establishment of a rail shuttle/inland port service would encourage development of port-oriented import and export facilities in either or both locations. Clustering future port-oriented development around an inland port facility would tend to rationalize land use patterns and minimize long-term VMT consistent with SCAG's goals.

Costs and Funding

The costs of an inland port/rail shuttle would be substantial: operating subsidies that could exceed $200 per round trip, and multi-million-dollar capital investments in rail terminals and line haul capacity. The service could never be financially self-sustaining, regardless of fuel prices or other economic developments.

Capital costs, while substantial, are probably not a major barrier to implementation. State and Federal infrastructure funding takes many forms, ranging from the Proposition 1b infrastructure bonds to TIFIA loans.

The service would require a permanent operating subsidy, for which there is no current source. The State of California is engaged in a massive bond funding effort for major goods movement infrastructure projects. It is clear that the statewide need greatly exceeds the $2 billion in bond funds. Funds for inland port implementation are very unlikely to come from the current bonds, and there is no follow-up bond initiative on the horizon.

The operating subsidy required to divert truck trips to the rail shuttle would be determined by the cost gap in Exhibit 38. The estimates suggest that the required subsidy would be at least $200 per container at current cost levels.

Exhibit 1: Rail Shuttle and Truck Costs for Inland Empire Round Trips

	RT Cost
50-container train	$ 679.18
100-container train	$ 587.85
200-container train	$ 514.33
Truck	$ 300.00

The 100-container train scenario would move 50,000 round trips per year (2 round trip trains per day, 250 days per year), and would require a nominal annual subsidy of $14.4 million at a unit cost difference of $287.85 per unit (Exhibit 2). Increasing truck costs due to the Port's Clean Truck Plans (CTP) could narrow the cost differential and thus reduce the subsidy requirements. Analysis of likely trucking cost impacts yields the comparisons in Exhibit 39.

Exhibit 2: Truck Cost Scenarios and Subsidies

Impact Source	*Inland Empire Truck Cost*[1]	*Nominal Subsidy per Unit*	*Annual Subsidy for 50,000 Units*
Current	$300	$287.85	$14.4 million
TWIC	$373	$214.85	$10.7 million
TWIC + LMC/IOO CTP	$446	$141.85	$7.1 million
TWIC + Employee CTP	$540	$47.85	$2.4 million

The Transportation Worker's Identification Card (TWIC) requirement is expected to increase labor costs. The Clean Truck Plan (CTP) with Licensed Motor Carrier/Independent Owner-Operator (LMC/IOO) or Employee Driver options would increase both labor and capital costs further. At the extreme, the annual subsidy for 50,000 units on a rail shuttle might be reduced from $14.4 million at current price levels to $2.4 million. These comparisons must be approached with caution, however, as the estimated impacts of drayage industry changes are highly uncertain and the same changes will also increase the cost of inland drayage for the rail shuttle operation.

There is a significant political barrier to be passed in creating a subsidy plan for rail freight operations of any kind. There are *no* current funding programs to subsidize freight operations. Rail passenger services are routinely subsidized, but freight subsidies are rare. A rail shuttle/inland port sponsor agency would have to create an entirely new subsidy system, without precedent. Given the current and controversial port container fee proposals, any subsidy proposal is likely to meet with commercial, political, and community objections. An operating subsidy for a relatively small reduction in truck traffic would not receive much local support.

Given multiple unmet funding needs for regional transportation of all kinds, Herculean efforts to funding the capital and operating needs for an inland port/rail shuttle service seem unwarranted.

The potential for large drayage cost increases due to TWIC requirements and the Ports' Clean Truck Program may eventually reduce the amount of subsidy and should be monitored, but are unlikely to eliminate the need for subsidy.

Institutional Barriers

None of the major stakeholder groups are enthusiastic about the rail shuttle/inland port concept.

- The Ports are justifiably more concerned about implementing their master rail plans and adding both on-dock and off-dock terminal capacity for long-haul inland rail movements.

[1] Ibid.

- The railroads do not see near-term business opportunities for rail shuttles, and are wary of public subsidy and public intervention in rail freight operations. Their highest priorities are conventional intermodal terminals and mainline capacity for long-haul business.

- The ocean carriers have minimal interest in rail shuttle/inland port operations and are skeptical of its success. They are far more concerned over port capacity and fees.

- Potential customers likewise have minimal interest and are skeptical.

- Regional planning agencies have other priorities and do not see the benefits of a rail shuttle/ inland port concept as justifying major investments of political capital or funding.

- Some Mira Loma community organizations are vehemently opposed to an inland port (at least as they imagine it) and have begun organizing resistance in advance of a definite inland port proposal.

- There is interest in an inland port in Victorville (SCLA), in Barstow, and in Antelope Valley, but those markets have yet to develop.

Conclusions

The study team was forced to conclude that while an inland port/rail shuttle service had intrinsic merit and would benefit the region, the concept also faced daunting implementation barriers while ranking low on the list of regional priorities. While an inland port/rail shuttle is a good idea, the efforts required to overcome the implementation barriers would not be justified, especially when the region has other, more pressing needs for goods movement resources.

Regional planning agencies should, however, monitor the development of port-related distribution businesses in Victorville (SCLA), Barstow, and the Antelope Valley to determine if markets for an inland port/shuttle service could or would develop there. SCAG should also monitor the status of available rail capacity on the main lines (as SCAG is already doing) and at the ports.

The one event that might make a difference is the outcome of the Port's Clean Truck Program. If that program results in reduced truck capacity and higher truck costs, the demand for rail shuttles might grow. The capacity and terminal issues would remain.

The conflicting demands on the regional rail system argue for further development of a regional rail plan encompassing both freight and passenger operations. Current and previous studies of rail capacity and the forthcoming multi-jurisdiction goods movement action plan address some of the issues and should supply a good foundation for additional analysis.

II. Background and Scope

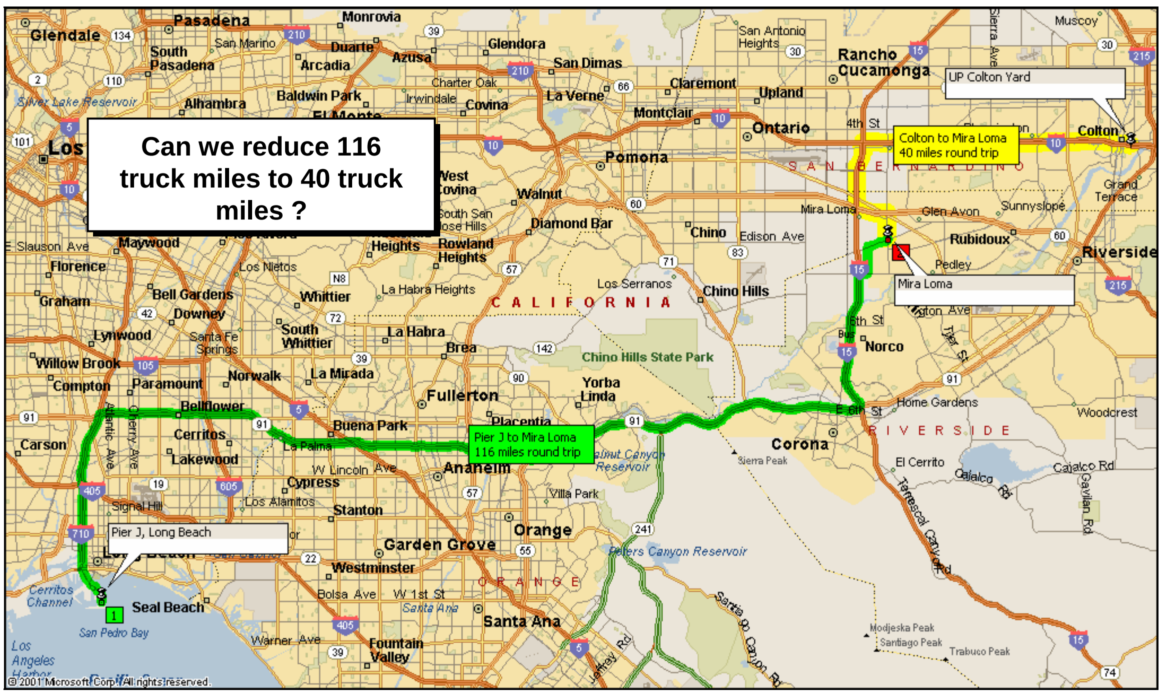
Project Objectives

The study has these broad objectives.

- Determine the purpose and benefits of an Inland Port and the various functions it might include
- Identify the potential utility of an Inland Port to users and stakeholders in the goods movement system
- Identify the potential freight traffic congestion relief

The key to success is truck VMT reduction. For example, to serve the concentration of distribution centers in Mira Loma, the industry currently trucks containers about 58 miles from the ports and 58 miles back, a total of 116 truck miles (Exhibit 3). If a rail shuttle could take those containers to a nearby point such as Colton by rail, it would incur only 40 round trip truck miles between Colton and Mira Loma.

Exhibit 3: Example of Mira Loma Trip VMT Savings



Tasks 1-2 established the underlying traffic flows, economic factors, and potential reductions in truck VMT and emissions. The focus in the final stage of the project is on operating strategies, implementation issues, and community acceptance for a rail shuttle and terminal sites in the Inland Empire or beyond.

Summary of Task 1& 2 Findings

Inland Port Purposes and Benefits

Study Tasks 1 and 2 concluded that an inland port following one or more of the models established elsewhere could serve the following purposes in the SCAG Region.

- **Freight Traffic Congestion Reduction.** By diverting port-related truck trips to rail, development of an inland port could reduce the net truck VMT required to transport future cargo volumes.

- **Emissions Reduction.** By diverting port-related truck trips to rail, development of an inland port could also reduce the net emissions (especially diesel particulate matter) associated with future freight flows.

- **Economic Development.** By encouraging efficient patterns of logistics-related business development, the presence of an inland port could assist in achieving long-term land use policy goals for inland areas.

- **Increasing Port Capacity**. By reducing the dwell time of those import and export containers it handles, and inland port can increase the effective throughput capability of port facilities.

Matching Inland Port Strategy With Locations

Early in the project the team looked at 29 case studies of inland ports and related developments and classified them by type. The two that show the most promise for the SCAG region are the Logistics Park and Satellite Marine Terminal models.

- "Logistics Park" – e.g. Alliance, Victorville, Quincy, Joliet, Richards-Gebaur, Huntsville

- "Satellite Marine Terminal" – e.g. Virginia Inland Port

The Logistics Park approach, typified by Alliance, Texas, uses a core of transportation and logistics facilities to encourage adjacent development of distribution centers and other truck trip generators. It is a long-term strategy to influence land use and rationalize goods movement patterns.

The Satellite Marine Terminal approach links an inland point, such as the Virginia Inland Port, to a specific seaport, such as Norfolk. This would be a single-purpose facility designed to serve an existing customer base and function as an extension of the Los Angeles and Long Beach marine terminals.

The different types have different functions and site requirements.

- Satellite Marine Terminals, Logistics Parks, and Agile Port terminals all provide potential benefits in different ways.

- Different possible Inland Port sites would serve different purposes.

- Sites closest to current markets offer near-term potential as satellite marine terminals.
- More distant sites in developing areas have greater potential as logistics parks.
- Strategic rail sites offer potential as agile port terminals.

A satellite marine terminal should be close to existing customers. A logistics park to influence land uses needs a site in a developing area.

To incorporate agile port functions, what counts is the strategic location within the rail network.

- The objective of agile port operations is to reduce container dwell time at port terminals and increase their throughput capacity.
- The core of the concept is rail transfer of unsorted inland containers from vessel to an inland point where sorting takes place.
- The agile port concept trades off additional cost (handling) and inland space for increased port throughput.

Project team analysis suggest that agile port concepts have limited near-term potential in Southern California, partly due to implementation barriers and partly due to reduced need.

- **Complexity.** The complexity of a port system with two ports, 14 terminals, multiple on-dock rail facilities, four off-dock terminals, and two line-haul railroads presents formidable operational and management challenges for an agile port system.
- **On-Dock Capacity.** Ironically, the intensive use of current on-dock facilities for long-haul intermodal trains leaves little, if any, capacity for agile port operations.
- **PierPass.** PierPass and the OffPeak program have successfully shifted 30-40% of the marine terminal truck trips to evening or early morning hours, thereby reducing terminal congestion and reducing the need for agile port operations.
- **Vessel Stowage Improvements.** The use of information to reduce the need for extra handling is a key component of the agile port concept, but is already being used to advantage.

Agile port operations are untested[2], and a system as large and complex as the San Pedro Bay ports would be a difficult first application. Neither the Ports nor the railroads see a near-term need for agile port operations.

Sites in the Central Inland Empire (e.g. Mira Loma) would be poor choices for an agile port terminal. Sites such as SCLA at Victorville or the potential site mentioned near Barstow would be far better. The Barstow site, in particular, offers the kind of open land and rail access desirable for agile port implementation.

[2] Although a demonstration at the Port of Tacoma did highlight the improvements possible through better use of information

Site/VMT Tradeoffs

A key goal of Tasks 1 and 2 was to estimate the potential VMT savings from different rail shuttle/inland port scenarios.

- MMA developed preliminary estimates of the truck VMT reduced by the construction of an inland port facility.
- MMA used detailed port truck origin and destination data based on trucker surveys that were conducted at each port terminal in 2004.
- Three inland port facility locations were analyzed: Colton, San Bernardino International Airport (SBIA) and the Southern California Logistics Airport (SCLA).

The sites nearer to Mira Loma (Colton and SBIA) offer a more favorable ratio of truck VMT saved per locomotive mile. The SCLA site shows a much lower ratio of VMT saved due to:

- Longer truck trips between Victorville and Mira Loma
- Longer rail trips between the Ports and SCLA.
- Additional locomotive power required to climb Cajon Pass.

Tasks 3-5 Objectives

Having established technical feasibility and estimated potential benefits in Tasks 1 and 2, the study team turned to issues of relative costs, institutional feasibility, and community acceptance. Specific issues addressed in this report include:

- Matching inland port strategy with potential locations.
- Site/VMT tradeoffs.
- Alternatives for Inland Empire sites.
- Rail capacity constraints.

III. Container Flows and Market Segments

Market Estimates

This section lays out the total flow of port containers and estimates the portions moving to and from the Inland Empire in the study context.

Exhibit 4 displays the total LA/LB container traffic for 2006 in TEU and estimated containers (at 1.85 TEU/container). The trade is roughly balanced in terms of container movements, with 4.4 million inbound loaded boxes and a mix of 4.1 million loaded and empty boxes outbound. The other boxes are considered "leakage" – units that come in through LA/LB and ultimately leave via some other port.

Exhibit 4: 2006 Los Angeles/Long Beach Container Trade

Container Trade in TEU

	Loaded Inbound	Loaded Outbound	Total Loaded	Empties	Total TEU
LB	3,719,680	1,290,843	5,010,523	2,279,842	7,290,365
LA	4,408,185	1,423,620	5,831,805	2,638,048	8,469,853
LA/LB	**8,127,865**	**2,714,463**	**10,842,328**	**4,917,890**	**15,760,218**

Container Trade in Containers*

	Loaded Inbound	Loaded Outbound	Total Loaded	Empties	Total Containers
LB	2,010,638	697,753	2,708,391	1,232,347	3,940,738
LA	2,382,803	769,524	3,152,327	1,425,972	4,578,299
LA/LB	**4,393,441**	**1,467,277**	**5,860,718**	**2,658,319**	**8,519,037**

Souce: Port websites   * at 1.85 TEU/container

Exhibit 5, prepared in draft for a current EPA drayage activity modeling effort, shows what happens to those containers. (Note that the numbers are slightly different, due to different sources.) The pattern is obviously complex, and most of the numbers shown are estimated through various means since there exist no definitive. Of the flows shown under "Origin/Destination" three are contained in the immediate vicinity of the port: inter-terminal drays, off-dock rail terminal drays, and container depot moves. Only the shipper/consignee movements would extend to the Inland Empire or beyond.

Exhibit 5: LA/LB Container Flow Chart

Marine Container Terminals

To/From Vessels	Number	%
Annual Port TEU	15,559,000	na
Equiv. Containers	8,410,270	100%
Inbound Loads	4,246,345	50%
Inbound Empties	42,892	1%
Outbound Loads	1,483,572	18%
Outbound Empties	2,637,461	31%

Non-gate Container Moves

	Barge	On-Dock Rail
	0%	18%
	-	772,063
	-	741,786
	Number	Number
IB Loads	-	764,342
IB Empties	-	7,721
OB Loads	-	267,043
OB Empties	-	474,743

Terminal Gate Moves

Outgate Containers	4,540,228
Outgate Chassis	103,187
Outgate Bobtails	515,935
Outgate Subtotal	**5,159,350**
Ingate Containers	4,493,130
Ingate Chassis	102,117
Ingate Bobtails	510,583
Ingate Subtotal	**5,105,830**
Terminal Gate Total	**10,265,180**
Net Port Container Gain/Loss	(47,098)

Port Container Trips

Port Container Trips	Orgin/Destination		
	Inter-Terminal Dray		
Outgate 42,892	**1%**	Number	
	Loads	42,463	
	Empties	429	
Ingate 41,210	Loads	14,836	
	Empties	26,375	
	Shippers/Consignees		
Outgate 3,078,133	**54%**	Number	
	Loads	2,293,027	
	Empties	801,129	
Ingate 3,078,133	Loads	801,129	
	Empties	2,293,027	
	Off-Dock Rail Intermodal		
Outgate 1,158,094	**27%**	Number	
	Loads	1,146,513	
	Empties	11,581	
Ingate 1,110,041	Loads	400,564	
	Empties	712,114	
	Container Depots		
Outgate 261,109		Number	
	Loads	0	
	Empties	263,746	
Ingate 263,746	Loads	0	
	Empties	263,746	
	Total Drayage Trips	**10,593,131**	

Crosstown Trips

Street Turns	**16,023**
Rail Terminal	
Bobtails	**257,743**
Chassis	**51,549**
Direct Off-Hires	**2,637**
Crosstown Total	**327,951**

Another perspective is given in Exhibit 6, derived from the TTX Trade Flow Study. That study contains the most recent estimates of rail and transload volumes. The 2005 total for truck movements (including local truck customer plus transloaders who eventually reship by rail) is estimated at 54.3%, almost exactly the same as the 54% shown for actual shippers and consignees in Exhibit 5.

Exhibit 6: Southern California Port Container Market Segments – Percent

Segment	2000	2001	2002	2003	2004	2005es*t
Local/Highway	25.8	23	26.6	25.8	30.0	31.6
Transload/Rail	26.6	27	25.9	26.6	24.3	22.7
Truck Total**	**52.4**	**50**	**52.5**	**52.4**	**54.3**	**54.3**
Intact Rail**	47.6	50	47.5	47.6	45.7	45.7

Source: TTX Trade Flow Study, 2006 * based on data through 3Q05

** Excludes rail terminal trips

The "transload" estimate used in the TTX study is narrower than that used in the Leachman Port Elasticity study. The TTX definition yields a combined rail and transload-to-rail estimate of 67.7%, smaller than the roughly 75% attributed to the Leachman study. Note, however, that the transload share shown in Exhibit 6 has been declining, which explains part of the difference. The Inland Empire share would be drawn from the 54.3% trucked, since none of the intact rail goes to Inland Empire facilities. (The BNSF San Bernardino terminal handles only domestic freight, although some westbound movements arrive in international containers that are moved to the ports when empty.)

Using the TTX estimates and the 2006 container data, Exhibit 7 estimates the loaded container volume sin each segment.

Exhibit 7: Port Segment Estimates

Segment	2006 estimated port container loads		2006 estimated port container truck trips*	
	Import	**Export**	**Import**	**Export**
Local/Highway	1,388,969	463,874	2,777,938	927,748
Transload/Rail	995,577	332,493	1,991,153	664,985
Truck Total	**2,384,546**	**796,367**	**4,769,091**	**1,592,733**
Intact Rail	2,008,895	670,911	Excludes rail terminal trips	

* Assume no container reuse; does not include bobtail or chassis moves

All figures for port truck trips to inland points are estimates from various sources, leading to a range of values depending on the underlying data and the estimation method. Previous port trucking studies have divided the flows by county, with the area immediately north of the ports separated out from the rest of Los Angeles County. The data for daily loaded container truck trips are summarized accordingly in Exhibit 8.

Exhibit 8: Regional Loaded Port Truck Shares

2005 Loaded Trucks	Port Area	Other LA Co.	Inland Empire	Ventura & Orange Cos.	Total
Import Loads (Departures)	66%	17%	7%	10%	100%
Export Loads (Arrivals)	58%	20%	8%	14%	100%
Total Loads	**64%**	**18%**	**7%**	**11%**	**100%**

A manual compilation of the port driver survey data is given in Exhibit 9. For this estimate an effort was made to assign and correct city names based on addresses and other descriptors. Exhibit 9 also includes the east Los Angeles County cities of Pomona and San Dimas in a functional definition of the Inland Empire (Exhibit 10).

Exhibit 9: Alternate Estimate of Inland Empire Share

City	State	Count	Share
BLOOMINGTON	CA	2	0.1%
CHINO	CA	18	1.1%
COLTON	CA	3	0.2%
CORONA	CA	5	0.3%
FONTANA	CA	32	2.0%
MIRA LOMA	CA	38	2.4%
MONTCLAIR	CA	2	0.1%
ONTARIO	CA	63	4.0%
POMONA	CA	13	0.8%
RANCHO CUCAMONGA	CA	4	0.3%
REDLANDS	CA	3	0.2%
RIALTO	CA	2	0.1%
RIVERSIDE	CA	8	0.5%
SAN BERNARDINO	CA	4	0.3%
SAN DIMAS	CA	1	0.1%
Inland Empire Total		**198**	**12.6%**
ADELANTO	CA	1	0.1%
BORON	CA	8	0.5%
LUCERNE VALLEY	CA	1	0.1%
VICTORVILLE	CA	1	0.1%
Victor Valley Total		**11**	**0.7%**
Other Total		**1364**	**86.7%**
Grand Total		**1573**	**100.0%**

Exhibit 10: Inland Empire Cities with Relative Port Truck Volumes

This approach yields an upper bound estimate of 12.6%, versus 7%. Exhibit 11 applies these shares to the data in Exhibit 7 to estimate Inland Empire loads.

Exhibit 11: Estimates of Inland Empire Port Container Trips

Loaded Containers

Segment	Estimated Inland Empire at 7%			Estimated Inland Empire at 12.6%		
	Import	**Export**	**Total**	**Import**	**Export**	**Total**
Local/Highway	194,456	64,942	259,398	349,671	116,779	466,450
Transload/Rail	139,381	46,549	185,930	250,635	83,704	334,339
Truck Total	**333,836**	**111,491**	**445,328**	**600,305**	**200,484**	**800,789**
Intact Rail	Excludes rail terminal trips			Excludes rail terminal trips		

Loaded and Empty Containers

Segment	Estimated Inland Empire at 7%			Estimated Inland Empire at 12.6%		
	Import	**Export**	**Total**	**Import**	**Export**	**Total**
Local/Highway	388,911	129,885	518,796	699,341	233,559	932,900
Transload/Rail	278,761	93,098	371,859	501,269	167,409	668,678
Truck Total	**667,673**	**222,983**	**890,655**	**1,200,610**	**400,968**	**1,601,578**
Intact Rail	Excludes rail terminal trips			Excludes rail terminal trips		

The estimate of the Inland Empire market made by Moffat & Nichol for the ACTA rail shuttle study in 2002 used data on *domestic* shipments from the BNSF San Bernardino intermodal terminal to infer the number of international shipments that must have come from the Ports. That method yielded an estimate of about 700,000 containers each direction, or 1.4 million total trips, exclusive of empties, bobtails, and chassis moves. This estimate lies roughly in the same range.

To provide context to this issue, at SR-71 trucks account for five percent of traffic on I-210, seven percent of traffic on I-10, twelve percent of traffic on SR-60 and seven percent of traffic on SR-91. On an average day 70,000 trucks use these four freeways to travel between the Los Angeles basin and the Inland Empire.[3] The annual weekday total would be roughly 17.5 million. The port container share would be 5-9% of the total.

The port truck share is much smaller than is often imagined. There are at least three reasons why the public might imagine that port traffic accounts for more than 5-9% of the trucks.

- Port traffic is widely publicized, estimated, and discussed, unlike the thousands of relatively anonymous trips that comprise the bulk of the truck traffic.
- International containers are readily identified by their uniform appearance, distinctive colors, and often their steamship line logos. Other types of truck traffic are harder to identify or categorize.
- The public does not readily differentiate between international containers moving to and from the ports and domestic containers moving to and from rail intermodal terminals. The additional domestic container traffic may be attributed to the ports.

[3] 2005 Caltrans Data

Potential Rail Diversions

Exhibit 12 provides a perspective on potential rail diversions in an Inland Port scenario. Assuming two round trips per day (one form each Port) with each train carrying 200 containers, the rail shuttle would divert 12-22% of the estimated port truck traffic in loaded and empty containers.

Exhibit 12: Rail Diversion Perspective

Segment	Estimated Inland Empire at 7%			Estimated Inland Empire at 12.6%		
	Import	Export	Total	Import	Export	Total
Total	667,673	222,983	890,655	1,200,610	400,968	1,601,578
Rail Diversions at 800/day (two round trip trains of 200 containers each)						
Total	15%	45%	22%	8%	25%	12%

The diversions of 800 daily trips would be 1.1% of the 70,000 daily total trucks.

IV. Inland Port/Rail Shuttle Strategy

Original Concept

The original concept for the rail shuttle/inland port combination entailed a conventional railroad intermodal train connecting the Ports with a conventional intermodal terminal in the Inland Empire. Were this combination feasible it would be attractive for its familiarity to the organizations involved and its relatively simple implementation. As the study progressed, however, it became apparent to the study team that many of the implicit assumptions in the conventional model were not true in Southern California, and that a conventional solution was not feasible.

Railroads maximize the length and utilization of conventional double-stack container trains to exploit their economies of scale and make maximum use of crew, locomotive, rail car, and track capacities. Conventional double-stack trains routinely have 30 five-platform cars with a combined capacity of 300 forty-foot containers. Such trains are nearly a mile long and require extensive terminal trackage for efficient loading and unloading at both ends of the trip.

Most such trains are assembled at individual on-dock rail terminals from either a single ocean carrier's import containers or from the combined containers of a consortium or vessel sharing agreement. Where individual terminals do not have enough containers with a common inland destination to create an efficient train, the containers are drayed to an off-dock terminal and combined there with containers from other terminals. For the foreseeable future it appears doubtful that individual terminals could generate frequent, efficient conventional trains to the Inland Empire. To avoid draying containers to a common location and reducing the VMT savings, it would probably be necessary to accept smaller, less efficient shuttle trains that can be assembled at one or a very few on-dock terminals. Inland port rail shuttles are therefore likely to be much smaller than conventional intermodal trains.

It is very unlikely that a large conventional intermodal terminal can be built in the central part of the Inland Empire. BNSF has tried without success for several years to either expand its San Bernardino intermodal terminal or locate a new site. Conventional intermodal terminals typically approach 300 acres, and require both main line access and an appropriate site configuration (essentially a long rectangle).

BNSF previously examined sites at SBIA, Devore, and other locations but found those sites unsuitable or inaccessible. This frustration accounts in part for BNSF's interest in an intermodal terminal at SCLA.

The study team's findings echoed BNSF's results: there are no near-term sites available for a large conventional intermodal facility in the Inland Empire.

- Sites easily accessible from UP and BNSF are heavily developed, with no available parcels large enough for a conventional intermodal terminal.

- Large sites are either inaccessible from the railroads, inappropriately zoned, or physically unsuitable as intermodal terminals.

With obvious difficulties in port rail operations and no feasible terminal sites, conventional rail intermodal operations to a conventional inland Empire intermodal terminal appear infeasible. These roadblocks to a conventional approach led the study team to consider alternative approaches.

The "Commuter" Shuttle Concept

The problems with a conventional approach led the study team to reformulate the concept. The team found the regional passenger and commuter systems offered a familiar template that could be adapted for container shuttles.

In regional or commuter rail systems such as Metrolink, relatively short trains (Exhibit 13) are operated between small terminals or stations. The smaller commuter trains can accelerate and brake faster than longer, heavier conventional freight trains (freight trains made up of either intermodal cars or ordinary freight cars, Exhibit 14).

Exhibit 13: Metrolink Commuter Train

Source: Metrolink Photo Archive, Los Angels Metrolink Historical Society

Exhibit 14: Double-Stack Freight Train

Source: The Tioga Group

This ability allows shorter trains to stick closer to schedule, reduce interference with other trains, and recover better from delays. Smaller trains can also use short station or terminal sidings to clear the main line for other trains.

Commuter and regional trains are often operated by regional transportation authorities (such as LAMTA) or contractors (often Amtrak) over trackage owned by private railroads (e.g. BNSF or UP). The passenger train operator pays to use the mainline trackage ("trackage rights") and may separately share in capital or maintenance costs.

In discussions with the railroads, introducing the commuter train paradigm was a significant breakthrough. Both BNSF and UP have experience working with commuter and regional passenger agencies, such as Metrolink, Amtrak, and the Capital Corridor. Thinking of a rail shuttle as a "commuter train for containers" facilitated comparisons with known operations rather than a hypothetical "publicly controlled freight train".

The commuter train paradigm opens the door to public-private partnership options. Where commuter trains are operated by public agencies (either directly or by contractors), the railroad is essentially charging rental for track space. This arrangement insulates the private railroad from the finances of the train operation. The operating subsidy would be going to the sponsoring agency, not to the private railroad – a significant political distinction. The commuter concept also facilitates shared capital investment for capacity improvements (trackage, signaling, control system, etc.). The California State Rail Plan is, in fact, heavily focused on improvements needed to facilitate more and better passenger service.

It must be noted, however, that railroads have rarely "rented out" their trackage to outside *freight* operators. Trackage rights agreements between railroads are common and familiar, although they can take years to negotiate and can cause day-to-day friction between host and operator. One option in Southern California may be to contract with Pacific Harbor Lines (PHL) as the shuttle operator. PHL will, in any case, perform the port-area switching for the rail shuttle. PHL already has trackage rights agreements with both railroads in the Port area. It is usually easier to extent existing relationships than to start anew.

There would likely be some resistance from the railroads and rail unions While passenger train jobs have long since shifted to Amtrak or regional transportation agencies, freight operating jobs are jealously guarded.

As Exhibit 15 suggests, the conventional and commuter paradigms have some elements in common: PHL switching at the Ports, third-party terminal operations inland, and subsidized shuttle operation by BNSF or UP.

Exhibit 15: Changing Gears: The "Commuter" Shuttle Concept

Original Concept

- PHL switching at ports
- Large, conventional inland terminal
- Third-party terminal operations
- UP or BNSF operation
- Operating subsidy

Problems

- No place for large inland terminal
- Institutional and economic barriers to UP or BNSF commitments
- Rail capacity shortfall

"Commuter" Concept

- PHL switching at ports
- Small commuter-style inland terminal – or terminals
- Third-party terminal operations
- UP or BNSF operation with subsidy
- UP or BNSF establish operating windows
- Public capital investment to maintain required capacity with shared use and benefits

The keys to success are the working relationship, the provision of scheduling "windows," public agency station development and operation, and joint investment in the required line capacity with shared benefits.

Basing a rail intermodal shuttle on the commuter model may be the best way to serve an inland port.

- Public agencies are comfortable with commuter/regional rail operations and economics.
- Both Class 1 railroads cooperate with commuter and regional rail operations in multiple locations.
- Railroads make a fixed number of operating "windows" available
- Sponsor agencies develop stations and administer subsidies
- Sponsor agencies invest in line capacity, and benefits are shared

There are several interrelated elements to a successful rail shuttle strategy.

- Improvements in port-area rail network to facilitate PHL train assembly.
- Selected public-private capital investments to increase network capacity, e.g. additional trackage, longer sidings, signaling, etc.
- Terminal location to minimize mainline conflicts.
- Joint planning to schedule shuttles in available operating windows.
- Negotiated limits on number and length of daily trains.

- Negotiated operating subsidy.

Finally, there would need to be an agreed implementation timeline and criteria for a successful service. The railroads are understandably concerned about open-ended commitments if the service does not attract enough traffic to yield the expected benefits.

With daily trips, the assembly time required at the ports, the wait for an operating window on the main line, and the time required to unload the train at the inland port terminal indicate that the service will be effectively "next morning" (e.g. containers ready to leave the marine terminal on Monday would be delivered in the Inland Empire on Tuesday morning.) "Next morning" service is not a fatal flaw. The heavy influx of import containers unloaded at vessel arrival – particularly with growing vessel sizes and multiple daily arrivals – often exceeds the aggregate port drayage capacity. In busy periods it is common for customers to designate "hot boxes" that must be delivered the same day as vessel arrival, and then allow the chosen drayage firm to stretch out delivery of the remaining boxes as needed. Thus, "next morning" delivery is already common. Daily train service would have to establish a high degree of reliability but would not be at a transit time disadvantage.

An alternative is for major ocean carriers (or consortia using the same on-dock terminals) to assemble one or two weekly rail shuttle trains corresponding to major vessel arrivals. If, for example, Ocean Carrier A has vessels arriving Monday and Thursday, its rail shuttle trains would depart the port Monday night and Thursday night for inland port delivery Tuesday and Friday mornings. On Wednesday it is unlikely that Ocean Carrier A would have sufficient Inland Empire container volume to warrant another departure. A similar system on a much larger scale is already in place for long-haul double-stack trains with departures keyed to vessel arrivals.

Empty containers could be returned to the ports on an entirely different schedule – again in parallel with long-haul train practices. By accumulating empties in an inland depot or buffer, the system could send full cars of empties, or conceivably full trains of empties, to each on-dock terminal.

Commuter-Sized Terminal Operations

In Tasks 1 and 2 Tioga considered three planning cases for an inland port rail intermodal terminal based on volumes of 30,000, 60,000, and 120,000 annual lifts. The planning factors above drive the following conceptual requirements. (Exhibit 16)

Exhibit 16: Sample Intermodal Terminal Planning Cases

Planning Factor	Small	Medium	Large
Annual Lifts	30,000	60,000	120,000
Minimum Acreage	15	30	60
Loading Track Length	2,000	4,000	8,000
Storage Track Length	5,000	10,000	20,000
Parking Slots	300	600	1200
Annual Gate Volume	45,000	90,000	180,000
Estimated Cost	$3.0-$ 7.5 Million	$6.0-$15 Million	$12-$30 Million

Terminal lift equipment would also be required. The number of machines is dependant upon the number of primary and secondary lifts to be provided as well as the schedule of both trains and the gates.

Exhibit 16 also has implications for site selection, as the minimal size shown for a large facility is 60 acres. The track length of 8000 feet implies the need for a long, narrow site.

In a conventional intermodal terminal most of the space is used for parking trailers, containers on chassis, and empty chassis. The parking space requirement is determined by traffic volume (the number of units inbound and outbound) and dwell time (the average time a unit remains parked). Multi-day dwell times create the need for large parking lots. Units arriving by train are parked until picked up by the customer or the customer's drayage carrier, and many units may wait in the yard for 3-5 days. Units arriving by truck for outbound movement by rail may also wait 1–2 days. Loaded units have the shortest dwell times, but it is still common for inbound units to be parked for 1-3 days. A small portion of the loads can be parked longer, at which time they begin accumulating storage charges. Empty units can remain parked much longer, especially when the terminal is being used as a source of empty equipment for local outbound loads.

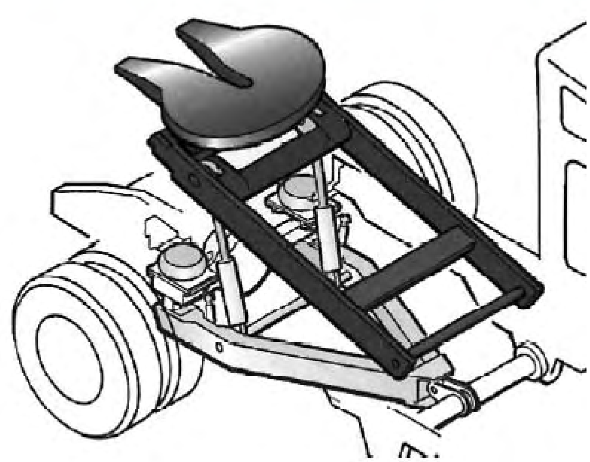
To maximize the throughput of small commuter-sized inland port terminals, the study team recommends implementation of one or more strategies to move bare chassis storage off-site and minimize on-site parking of all kinds. Bare container chassis can be particularly troublesome. At terminals without neutral chassis pools each ocean carrier must maintain its own pool of chassis, and utilization of chassis and terminal space suffers. There is a strong industry trend toward neutral chassis pools in which the bare chassis are used by multiple member carriers. Neutral chassis pools have been established by Maher Terminals, Trac-Lease, and OCEMA (the Ocean Container Equipment Management Association). Neutral chassis pools typically reduce on-terminal chassis fleet size by about 25%, but they still store chassis on-site.

Remote parking lots are one option. Congestion at SCAG region intermodal terminals has led the railroads to establish remote parking lots. BNSF has remote parking lots for different purpose and customers at both Hobart and San Bernardino. At an inland port, one or more remote parking lots could be used for bare chassis supply or storage of empty containers. Without valuable merchandise inside, these units do not require the level of security demanded for loaded units.

The key to efficient operation of a remote lot is access for terminal yard tractors so that units can be moved between sites without time-consuming equipment inspection and interchange procedures. Yard tractors (Exhibit 17 and Exhibit 18) have powered "fifth wheel" hitches to raise trailers and chassis without retracting the landing gear.

Exhibit 17: Yard Tractor

Exhibit 18: Powered Yard Tractor "Fifth Wheel"



Yard tractors usually move trailers and chassis without connecting the trailer air brakes. These two practices dramatically reduce the time and cost of moving units around the terminal. Ideally, these movements should take place on a private, dedicated road between the sites with no access for public vehicles.

There are two alternatives where private access roads are not feasible.

- Permitted operation on designated public streets, perhaps in designated lanes. This alternative may encounter local opposition on safety grounds.

- Inter-site movement by licensed highway tractors with trailer landing gear raised and brakes connected. This alternative would increase the time and cost.

A key attraction of a remote lot strategy is its flexibility. Remote parking lots can use smaller, odd-shaped parcels unsuitable for the intermodal terminal itself. Sites under electric power lines or elevated freeways would be ideal. Remote lots could also be established as interim land uses, since all that would be required is a level gravel surface and a chain link fence.

Ideally, the small inland port terminal should be a "live lift" operation. In live lift operations inbound containers are transferred from the train to waiting chassis already attached to the drayage tractor for delivery and are never parked in the terminal. Outbound containers would be drayed directly to trackside and transferred from the road chassis to the train, again without parking in the terminal.

At conventional terminals live lifts are usually performed only for high priority inbound loads and occasional outbound loads. The dominant practice is to unload the inbound containers to bare chassis that are parked for later drayage. This method disconnects the drayage and train operations and allows the railcars to be moved out of the way so the loading tracks are free for another train.

The proposed shuttle operation would change that paradigm. All inbound containers would be coming from the ports on either the same day or the previous day, making it possible to plan the delivery drayage and set customer appointments for many of the inbound loads. With a neutral chassis pool it should be possible to stage bare chassis at trackside for the inbound train.

Drayage drivers would pick up inbound loads from trackside, avoiding the cost of moving them to a parking lot whenever possible. There will inevitably be exceptions for which a small parking area will be needed.

Outbound units being returned to the ports – predominantly or exclusively empty containers – will need to be loaded according to the on-dock terminal of destination. To utilize train capacity efficiently each rail car headed back to the port should be full. Depending on the rail cars used, meeting this goal would require that outbound 40' units be accumulated and loaded in groups of two (for single-platform double-stack cars), five (for five-platform sets of single-level cars), or ten (for five-platform double-stack cars). In all likelihood this need would be met by using a remote lot to stage the empty units.

An alternative approach would be to establish empty container depots near the inland port terminal. Empties would be returned to the depots, and the depots would manage the flow of empties back to port terminals. This approach could have multiple benefits.

- Container depot capacity in the port area is becoming tight. Locations in the Inland Empire or beyond would add needed capacity.
- By holding more empties outside the port marine terminals, this strategy would increase the port capacity for loads and reduce empty dwell time. Currently, empties typically accumulate and take up terminal space until they are either loaded on an outbound vessel or drayed to a depot.

Off-terminal "buffer" sites have been proposed as a means of increasing port capacity and shifting some of the container traffic volume to off-peak hours. PierPass has addressed the off-peak issue, but off-terminal "buffers" in the form of Inland Empire depots linked by a rail shuttle might still contribute to net port capacity.

Agile Port Concepts

Agile Port concepts were discussed in detail in the Task 1 & 2 Report. That discussion is summarized and concluded here.

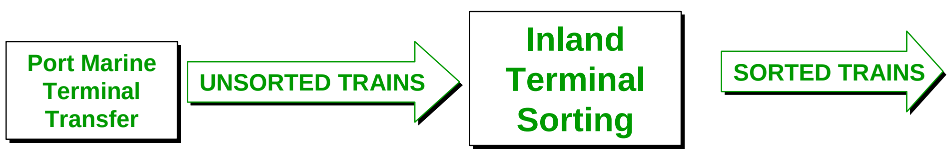
Background

As noted in the Task 1&2 Report, the term "agile port" has taken on many shades of meaning from a precise definition tied to military deployment to a generalized notion of increased port efficiency linked to inland transport. A crucial factor in the potential of agile port systems is alignment between planning objectives and system advantages: the agile port concept is primarily aimed at improving port throughput, not at rail efficiency or truck diversion.

The general objective of agile port operations is to reduce container dwell time at port terminals and increase their throughput capacity. The core of the concept is rail transfer of unsorted inland containers from vessel to an inland point where sorting takes place. This inland *sorting* function is internal to the railroad, and should be distinguished from inland *port* functions that involve interchanging containers with customers.

The agile port concept trades off additional cost (handling) and inland space for increased port throughput. In the kind of agile port operations commonly envisioned for inland ports (Exhibit 19), the marine terminals would load trains on a first-come, first served basis, regardless of destination. It is expected that this operating strategy would free up scarce marine terminal space by reducing dwell times and reduce the need to dray containers to rail terminals.

Exhibit 19: Agile Port Operations



As implied in Exhibit 19, this concept would require additional handling at the inland sorting point. It is implicitly assumed that this task could be done efficiently at an inland facility that was designed for the purpose. This concept does, however, entail additional handling, cost, and delay as the price for improved marine terminal fluidity. As a strategy it is most attractive where seaport space constraints are so great that the additional costs of double handling seem justified.

In Southern California, elements of the Agile Port Concept might be used to:

- move truck traffic off congested highways, and
- increase the throughput of existing marine terminals.

To take trucks off Southern California highways an agile port operation would have to substitute rail moves for drayage to off-dock rail yards, for drayage to the Inland Empire, or for drayage to markets west of the Rockies (since markets east of the Rockies are already served predominantly by rail).

Reducing Truck Traffic to Off-dock Terminals

Marine container terminals now do a significant amount of sorting to build trains that can move intact to inland points such as Chicago or Atlanta. The disadvantages of this system are that:

- Inland-bound rail containers that are not put on the first trains often have longer dwell times.
- Where rail volume is insufficient to make up an train or a block to a specific inland destination, those containers will usually be trucked to a near-dock intermodal yard.

At present, less than half of the rail volume is handled on-dock, the rest being trucked to intermodal terminals north of the ports.

A completely successful agile port operation would, in theory, bypass the off-dock rail intermodal terminals (e.g. the ICTF and Hobart) by moving directly from on-dock terminals to a sorting point outside the LA basin. In principle:

- Existing marine container terminals would use information and operational refinements to load import containers to rail as quickly and efficiently as possible.
- Adequate storage and support trackage would be available in the port area to facilitate building and blocking trains as required.
- While the rail corridor itself (e.g. the Alameda Corridor) would not be dedicated, dedicated rail shuttles would connect the ports with one or more inland sorting points.
- At the inland sorting point, additional sorting and blocking of rail cars and containers would yield outbound trains that could proceed intact to inland destinations.
- Westbound, the process would be reversed, with the inland sorting point splitting, blocking, and sorting railcars and containers as needed to create trains to move intact to individual marine terminals.

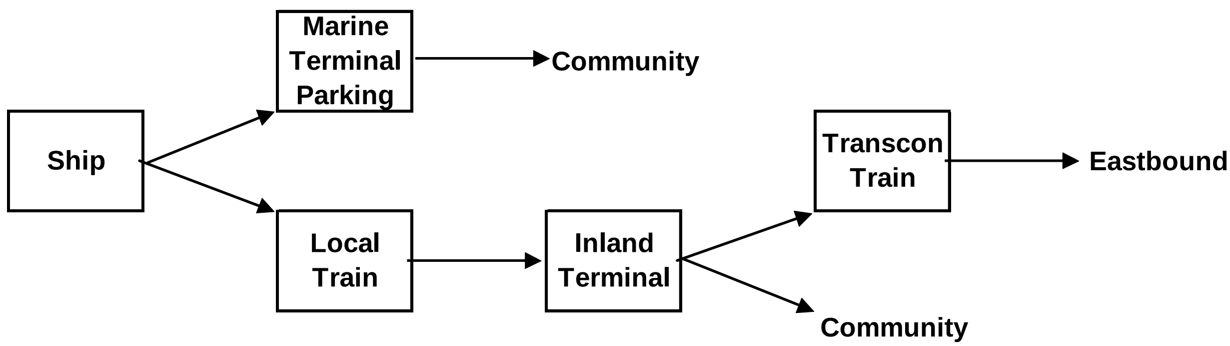
Inland Empire Potential

In the most basic operational concept (Exhibit 20) imported cargo that is unloaded from the ship would be segregated into two categories at the time of unloading:

- Local cargo would be parked in the marine terminal to await release to customers.
- Inland Empire and long-haul intermodal cargo would be immediately loaded onto rail cars and moved to the inland sorting point. There it would be resorted into Inland Empire cargo (for local drayage) and into various blocks for eastbound

movement (for onward rail movement). The local containers would move in bond and wait at the inland location for the various releases necessary prior to dispatch to customers in the community.

Exhibit 20: Basic Agile Port Operational Concept



Conceptually, the simplest operation would be to unload every container from the shuttle train and reload those headed further inland by rail. This practice would permit optimum slot utilization of rail equipment. To the extent that intelligent blocking decisions can be make quickly in the marine terminal it may be possible avoid double handling some of the containers at the inland terminal, thereby permitting more sophisticated management of cost trade offs.

In this respect the concept inland sorting concept could be merged with inland port functions, but the combination may not be practical. If the inland sorting point were located at an inland port serving regional customers, the same trains that took unsorted containers to be resorted into inland trains would also take containers to be delivered locally. In the near term, however, locating enough rail-served land to build a large terminal for both sorting and loading/unloading is not likely in an area already populated with potential customers – witness the difficulty of locating such a terminal in the Inland Empire. A combined facility would be more feasible in a developing market area such as Barstow or Victorville, but it would be longer before the local market developed.

Were an agile port system to be implemented there may be advantages to combining it with inland port operations to build scale economies. For example, until the local markets have grown substantially it would be difficult to justify shuttle service to inland ports at Victorville or Barstow. If such points became agile port sorting centers, however, it may be possible to serve local customers with the same trains.

An Agile Port sorting terminal would require both the ability to sort loaded and empty rail cars, and the ability to transfer containers between cars.

- The ability to efficiently sort cars requires a classification yard with many more tracks than the proposed intermodal terminal.

- Sorting containers between cars would best be accomplished with very large wide-span rail-mounted gantry cranes.

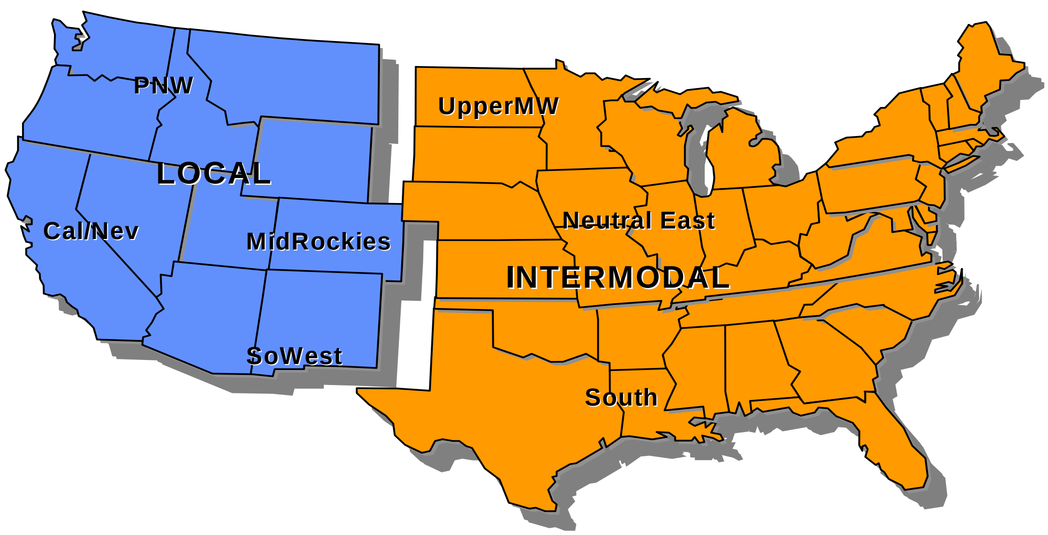
Barstow may be a suitable location for an Agile Port sorting facility, if one were to be built in California. Barstow has lots of room outside of town along the BNSF line, giving BNSF the flexibility to develop a purpose-built Agile Port sorting yard. The railroad would not want to commingle the functions of Agile Port sorting with terminal loading/unloading.

Short-Haul Potential

Agile port concepts would not be conducive to short-haul rail service west of the Rockies. The basic stumbling block of short-haul intermodal service is the cost and delay inherent in intermodal terminal operations that motor carriers avoid.

In a conventional intermodal operation the cost and time penalties of terminal operations must be spread over at least 600–800 miles of economical linehaul operations to be price and time competitive with trucks. Intermodal has very little presence in lanes of less than 750 miles, and almost none under 500 miles. The busiest intermodal lane in between Los Angeles and Chicago, about 2000 miles. From Southern California, intermodal is typically competitive for traffic moving to or from points East of the Rockies (Exhibit 21

Exhibit 21: Local versus Intermodal Markets



With additional terminal handling steps, agile port operations would face even greater handicaps in trying to compete in short-haul markets. As Exhibit 22 and Exhibit 23 suggest, the major California, Nevada, and Arizona markets are less than 500 miles from Los Angeles, and there are only a few smaller markets in the 500- to 1,000-mile range.

Exhibit 22: Rail Market Geography

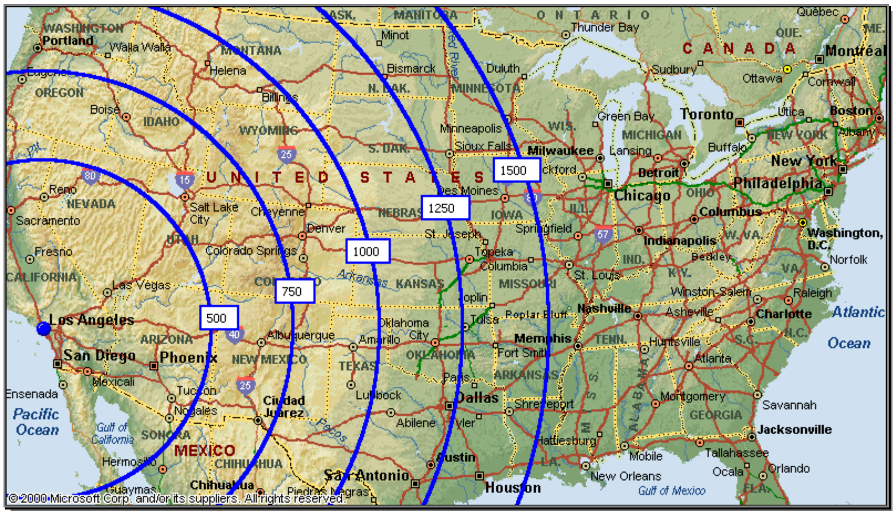
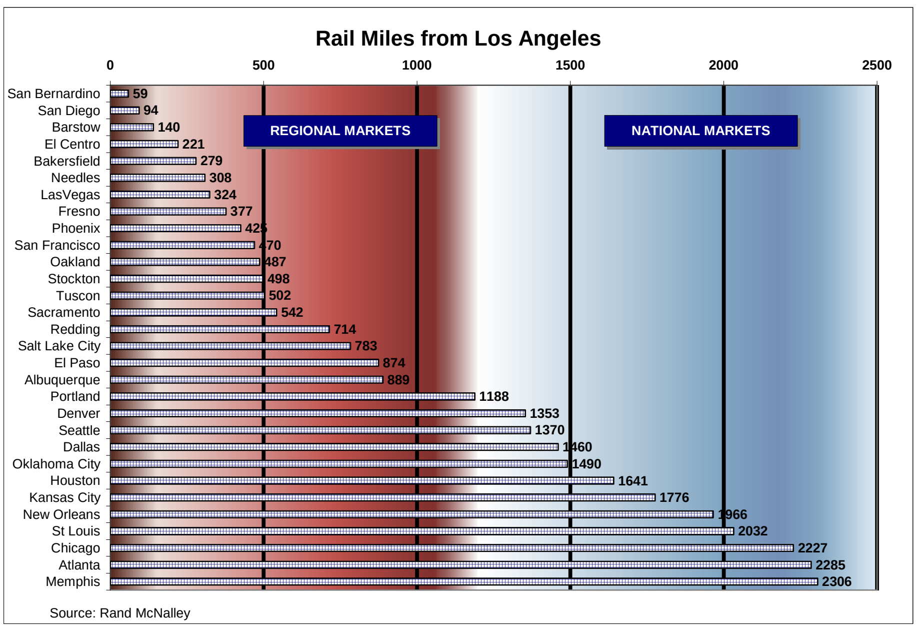


Exhibit 23: Distances to Rail Markets



An agile port system would not be effective in serving such markets and does not have the potential to take trucks to those markets off the highway.

Complexity

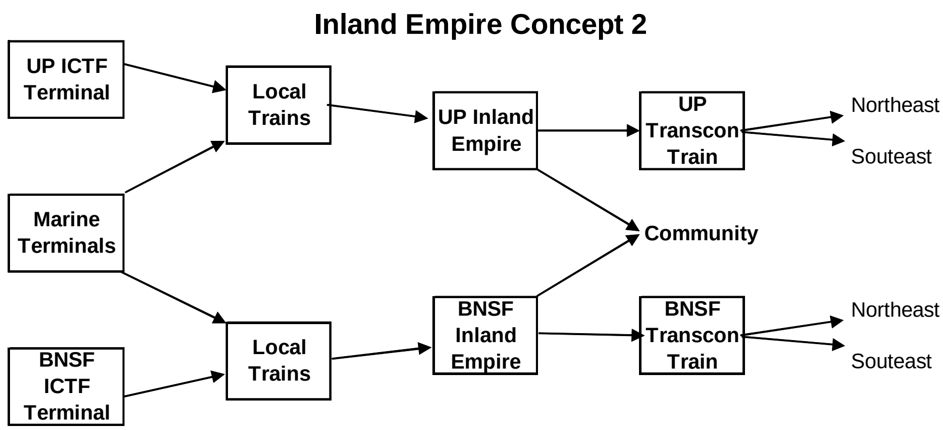
Implicit in Exhibit 20 are some key simplifying assumptions: one marine terminal, one railroad, and one inland sorting point. Actual operational complexity is increased because there are multiple origins in the port area – twelve marine terminals with several on-dock facilities – and multiple railroads involved in the movement.

- **Switching railroad –** Pacific Harbor Lines serving the port area

- **Class I railroads –** Union Pacific and BNSF each have individual commercial and operational considerations.

As Exhibit 24 suggests, under these circumstances the simple agile port concept quickly becomes a complex network. Moreover, as the port container flows are split into multiple segments the economies of scale can evaporate.

Exhibit 24: Complex Agile Port Network



Agile Port vs. EMT

The agile port concept is closely related to the "efficient marine terminal" (EMT) concept, which also uses information to speed the flow of containers and reduce dwell time. The two concepts are complementary, but EMT operations can reduce the need for agile port functions. The key factor in the ability to reduce dwell time in an EMT is vessel storage. If an arriving vessel has been stowed in the correct order for quick transfer to rail, the need for sorting anywhere is greatly reduced. Ideally, rail-bonded containers should come off the vessel grouped by inland destination, enabling the on-dock terminal to create entire trains for specific inland points without time-consuming sorting at the port. Such trains could bypass any inland sorting point.

Cooperation between ocean carriers and railroads has led to pioneering EMT operations at San Pedro Bay. BNSF reports, for example, that OOCL vessels now arrive pre-blocked for rail transfer and that the resulting trains can move intact to Midwest points. Such strategies obviate the need for agile port operations.

Both railroads serving the ports are attempting to run longer trains with greater utilization and less intermediate handling – in direct contrast to the agile port concepts. BNSF, in particular, has been increasingly insistent that trains from the port reach the maximum desired length and have an absolute minimum of empty container slots. Besides making for more efficient line hauls, this strategy makes maximum use of scarce track and line capacity. BNSF's objective is to load eastbound trains on-dock or off-dock so that they require no additional handling before Clovis, NM. UP's parallel strategy is to avoid handling before El Paso, TX.

Implementation Barriers

Conventional on-dock operations, future shuttle trains, and agile port operations all come up against the same barrier: port rail infrastructure. At present, containers bound for lower-volume inland destinations are usually drayed to off-dock rail terminals because there is no way for PHL or the marine terminals to build efficiently sized trains for such traffic. The on-dock rail facilities may generate solid trains of containers for Chicago, but containers for Kansas City might be drayed. To build a Kansas City train, PHL would have to combine cars from multiple on-dock terminals. The port rail infrastructure, however, lacks the capacity and flexibility to do so efficiently.

As noted in the Inland Port Study reports, rail shuttle trains to the Inland Empire – or rail shuttle trains to an agile port terminal – face the same obstacles. Contacts with PHL suggest that neither Port's rail system is set up to combine cars from multiple terminals. Proposed rail capacity improvements would add some flexibility. Delays in implementing those improvements, however, mean that the new capacity will be filled almost immediately with growing long-haul rail traffic.

Conversely, the same port-area rail improvements required to facilitate agile port or rail shuttle operations would also facilitate expanded EMT operations. If PHL had the ability to combine small blocks of BNSF or UP cars from multiple terminals efficiently, those cars could then be sorted as needed at existing inland terminals before their final destination.

Agile Port Findings

Agile port operations appear to have limited applicability to Southern California's issues. The agile port approach is not necessarily an easier solution to off-dock drayage than conventional intermodal strategies. Agile port operations will not help penetrate short-haul intermodal markets. The encouraging observation, however, is that Efficient Marine Terminal operations are providing some of the same benefits and reducing the need to implement agile port concepts.

Southern California's ports are a complex system of terminals and rail carriers, making detailed agile port operations difficult to imagine or implement. The port-area rail system at Los Angeles and Long Beach is heavily burdened with existing and anticipated intermodal traffic already, and planned improvements have been delayed. Agile port operations would require the same capacity and flexibility improvements needed to handle port growth in a conventional rail system. Agile port operations would perhaps be best suited to new or reconstructed marine terminals whose rail infrastructure could be designed to suit.

V. Port Area Rail Operations

Overview

The logistics of a rail shuttle/inland port combination are seriously complicated by the fact that Southern California has two ports and multiple container terminals served by two railroads. It is perhaps too easy to refer to "the Port" and sketch movement diagrams as if the Ports of Los Angeles and Long Beach were a single location. In fact, as Exhibit 25 shows, the port complex includes fourteen terminals which are served by several on-dock rail terminals.

Exhibit 25: LA/LB Container Terminals

The multiple on-dock terminals at the two ports significantly increase the time and cost required to assemble rail shuttle trains and would force a tradeoff. If individual on-dock terminals cannot generate efficiently sized daily rail shuttle trains, then either PHL will experience greater time and cost of assembly or the system will not be able to offer daily service.

Pacific Harbor Line

Pacific Harbor Line (Exhibit 26) serves the on-dock terminals and connects them to UP and BNSF. Discussions with PHL have revealed serious infrastructure barriers to efficient port-area assembly of rail shuttle trains.

Exhibit 26: PHL Service to Ports

Ordinarily, entire intermodal trains are loaded and unloaded within individual on-dock terminals. Rarely does PHL attempt to make up an outbound train by assembling cars from multiple terminals, or breakup an incoming train between multiple export terminals. To do so PHL would need substantially more off-dock yard trackage in strategic locations. Newer purpose-built intermodal facilities such as TICTF at Los Angeles have more yard trackage than older, legacy facilities such as LBCT at Long Beach. Basically, the legacy port rail network was not designed to assemble intermodal trains from multiple terminals and does not work well for that purpose.

The Port's rail infrastructure development plans would add substantially to the switching capacity of PHL. Implementation of those plans, however, is not imminent. By the time the new capacity is built it will be largely full with higher priority long-haul intermodal traffic.

Each on-dock terminal operator who participates in the shuttle train operation may need to set aside space within their operation to load a block of one, two, or three double-stack cars. The cars could be pulled by a PHL switch crew to assemble a train within the port area. This alternative would work in the LA portion on Terminal Island, and at the Hanjin Terminal at the Port of Long Beach. The remainder of the terminals in the Port of Long Beach accessed by rail beyond 9th Street in Long Beach are presently too congested and lack run-around tracks to allow access without disrupting on-dock loading operations. There are several capital improvement projects in the Port infrastructure plan that would, when completed, change the operation to allow for an inland terminal shuttle train operation within the Port of Long Beach. However, until these changes are made it is not feasible to consider a shuttle train service that builds the train by pulling loaded cars from individual terminals within the Port of Long Beach.

In addition to not being able to access the on-dock facilities in the Port of Long Beach, pulling cars from the Yang Ming facility by the same switch crew that assembles the train by switching the Terminal Island on-dock facilities may not be possible given the location and the volume of long haul intermodal trains on the Alameda Corridor. The terminals that could be readily accessed as part of a container shuttle train service are Pier 400, Global Gateway South, NYK/Evergreen, and Hanjin.

The operation of the shuttle train described above could be accomplished by a new PHL crew that would come on duty based on the time the finished shuttle train would depart on the Alameda Corridor. They would start from Pier A Yard by pulling an inbound group of double stack cars loaded with empty containers returned from the inland terminal. These cars would need to be held in PHL's Pier A Yard from the time of arrival of the inland shuttle train until it is pulled by the PHL switch crew. Depending on the timing of the arrival of this train, PHL may have some difficulty holding the train given the need to pull loaded cars from the on-dock facilities before placing the returning cars with the empty containers. Once the outbound shuttle train is assembled it will need to depart for the inland terminal.

The crew that operates the shuttle to the inland terminal would probably not be able to make a return trip within the hours of service requirements. A second crew would then be necessary to operate the train from the inland terminal to the port area. This crew will need to be timed to allow it to pull the cars of empty containers prior to the arrival of the shuttle from the port. While a second crew would add to the operating cost, the necessity of constructing inland terminals that can hold two sets of cars – the inbound loads as well as the outbound empties – will be eliminated. This will allow for either a smaller footprint for the terminal or more throughput capacity because more loaded cars can be spotted with once-a-day service.

The staging of the empty container train in Pier A Yard would not be not as disruptive to current PHL operations as would be the case if the loaded outbound train needed to be staged in the yard. The PHL classification operation starts at 4:00 PM and, given that more track space is required during carload classification operations, making one or two tracks unavailable in the evening could interfere with carload operations. Also, the carload jobs that service non-intermodal customers pull cars from Pier A Yard early in the day, freeing up space in the yard.

The observation that two "line haul" crews would likely be required for the inland terminal shuttle is based on experience. There is a daily non-container shuttle train operation between the Port and the Inland Empire that has existed for years. BNSF and PHL operate a Slab Train Shuttle between Pasha Yard on PHL and California Steel in Fontana on BNSF. This operation consists of a daylight operation loading of imported steel slabs onto railcars for a 7:00 PM shuttle train departure for Fontana. At the same time, a train of empty cars departs Fontana with a scheduled arrival at PHL no later than 6:00 AM. This service operates seven days a week, as needed, depending on import steel delivery at the port.

BNSF local operating personal agree with the PHL observation that a single crew cannot make the turn-around, and that two crews would be necessary. They confirm that the Slab Train is a two-crew operation and that on occasion the inbound crew returning the empty cars cannot complete the move within the 12 hours of service allowed, due to congestion in the area. They also confirm the PHL observation that a shuttle operation at on-dock facilities in the Port of Long Beach are not feasible at present, but could be once infrastructure changes in the Port plan are funded and made.

Assembly of rail shuttle trains at the Ports is thus less feasible and more costly than assumed at the outset of the study. For the near term PHL and the Ports are hamstrung by lack of capacity. There is likely to be a perpetual capacity limit, with that capacity (justifiably) taken up with long-haul traffic.

The long-term limitations on port-area rail capacity is a serious barrier to implementation of a rail shuttle. Cost aside, it appears unlikely that the port-area rail network will ever be able to support assembly and breakup of multi-terminal rail shuttles without disruption to higher-priority movements.

VI. Main Line Rail Operations

Mainline Rail Capacity

The emerging shortage of mainline rail capacity between the Ports and the Inland Empire is a second major implementation barrier to a rail shuttle. The BNSF and UP lines are faced with mounting demands from multiple sources of traffic growth, most of which have higher private and public priority than a rail shuttle. While an aggressive regional rail expansion plan might create sufficient capacity to meet these multiple needs, it is not clear that the benefits of a rail shuttle would justify the incremental cost.

Through the early 1990s railroads typically had reserve capacity and sought to rationalize their physical plant by retiring the unproductive excess. Since then, however, rising rail freight levels and increased demand for publicly sponsored passenger service has exhausted the reserve rail capacity in many places. Railroads facing capacity constraints understandably prefer to use that capacity for the most attractive long-haul business.

There are three sources of escalating demand for rail capacity between the Ports and the Inland Empire.

- **Trade growth.** Continued growth in intermodal container traffic through the Ports is probably the single most important factor.
- **Domestic freight growth.** The expanding population, production, and consumption of the SCAG region is resulting in domestic intermodal and carload freight growth.
- **Passenger Rail.** Portions of the same rail routes traveled by freight are used for regional and interstate passenger service. Passenger service growth in the form of new routes and more trains on existing routes increases the pressure on mainline capacity.

Public policy is closely aligned with the railroads' preferences in this regard. Rail transportation is more efficient on longer trips. It would not be in the public interest for short-haul rail shuttles to displace long-haul container trains. Long-haul trains eliminate thousands of truck miles regionally and nationally. The congestion and emissions relief benefits of moving a container 2000 miles to Chicago clearly outweigh the benefits of moving one to the Inland Empire. The public and the railroads have a common need to maintain capacity for existing and expected long-haul trains, while providing sufficient capacity for the rail shuttles.

UP Operations Perspective

The UP operates two main lines between Colton and Los Angeles in the area of interest for this study. The Los Angeles Subdivision operates from East Redondo to Colton via Riverside and the Alhambra Sub operates from Yuma Jct. to Colton. The LA Subdivision connects with the Alameda Corridor at East Redondo.

UP is working toward increasing capacity in this corridor by double tracking the Alhambra Subdivision, scheduled to be completed in 2009 and is working with the Ontario Airport Authority to locate what will be a mile long connection between the LA and Alhambra Subdivision just west of the expanded airport. The combination of these two UP capital investment projects will increase operating flexibility and thus capacity for trains in and out of the LA Basin. A third capital investment project (Colton Crossing) involves improving efficiency for UP and BNSF operations in Colton where currently the two railroads cross each other at grade. The growth in traffic on both railroads has resulted in delays while one train is held short of the crossing diamond waiting for a train of the other railroad to clear the crossing. The project involves building a railroad fly-over to grade separate the two railroad thus eliminating the need to hold trains on account of the other railroad. The final design of the fly-over is still being negotiated, and more than likely will not be operational until 2010 at earliest.

The UP local operating staff agreed that there is not a large plot of land upon which a intermodal terminal, as typically configured, can be located west of Colton. They also understand the need to focus on congestion mitigation and air quality improvement in the entire LA Basin, not just to move the problems out of the ports to another point further inland. As a result they understand the project focus on VMT as the measure of improvement.

The idea of basing a container shuttle operation on commuter operations has appeal for to the local UP operating officers interviewed; however they quickly point out that UP headquarters in Omaha has the final authority. The local officers even express a possible interest in operating the shuttle trains with UP crews, although they would entertain the idea of PHL operations or other qualified train operation. They are concerned about the impact any new operation would have on long haul train operations and capacity. They point out that the expansion projects that are planned or ongoing are to meet anticipated growth in current volume, not new operations such as the container shuttle. They are also concerned that public officials do not have an adequate understanding on how new operations, no matter how modest they may seem, can have on the entire rail network.

BNSF Local Operations Comments on the Inland Shuttle Train Concept

The local BNSF officers have the same concerns about capacity as has been raised by UP. They also state, as have others, that short haul container moves of this nature do not break even for the railroads and that spending line capacity for these short moves at the expense of long haul is not a sound business decision for the railroads. Thus they make the same observation as others have, in order to operate the shuttle train service capacity must be increased and, given the growth projection for the region, it must be beyond what is planned to meet the long haul growth demand.

Alternative Line Haul Systems

One obvious conceptual alternative is use of a different line haul technology to move containers between the seaports and one or more inland terminals. There are conceptual proposals for maglev and linear induction motor (LIM) systems currently under study by the ports for their feasibility between port terminals and near-dock rail facilities (ICTF and the proposed SCIG). A brief discussion of these systems and the challenges they face is presented in Appendix A.

The port study now in progress should help answer these questions.

1. **How are containers moved from vessel to system loading point (and vice versa)?** At present, every container in North America is moved on chassis between the apron under the crane and the container yard or on-dock rail terminal.

2. **How are containers loaded and unloaded to/from system vehicles?** At present, marine terminals in North America use gantry cranes, side loaders, reach stackers, or straddle carriers to handle containers or chassis, on rail cars, or on the ground.

3. **How does the system get into, through, and out of the marine (and inland) terminal?** Conventional rail tracks embedded in pavement allow trucks to pass over. No terminals have rail loading at ship side.

4. **How does the system link multiple marine and/or inland terminals?** As noted elsewhere, the Los Angeles and Long Beach terminals are scattered over 20 square miles of waterfront and separated by water, highway, rail, and development barriers.

5. **What right-of-way does the system use to link terminals?** Absent a feasible right-of-way other system features are irrelevant.

6. **How are system movements planned and controlled?** The system must correctly identify each container, move it to the correct terminal, position it for loading/unloading, and hand-off control to terminal gate (inland) or vessel (marine) systems.

7. **How does the system recover from disruptions?** The full range of potential disruptions might include vehicle failure or malfunction; central system failure or error; guideway failure or damage; power shortage or loss; and accidental or malicious damage.

8. **Where will import containers be sorted and forwarded to final destination by truck or rail?** The agile port concept on which all the systems implicitly rely shifts the sorting function to the inland terminal. The inland terminal must be sized, planned, equipped, and operated accordingly.

9. **What are the full capital costs of the system?** The capital costs must encompass the right-of-way, the guideway, the vehicles, the control system, the terminals, and any ancillary facilities or systems.

10. **What are the full vessel-to-destination operating costs?** The operating cost estimates would have to include every step: unloading the vessel, operating the terminals, loading and unloading, sorting, linehaul, transfer to another mode, overhead, etc.

11. **What is the system throughput capability?** The system will be limited by its slowest link, which is likely to be in the terminals rather than on the line-haul. The system will need to cope with volume peaks and valleys, and comparisons should be based on reliable, day-in/day-out throughput rather than optimized conditions.

12. **What impact will the system have on communities, highways, and other urban features?** The existing proposals point out the potential emissions advantages but do not discuss the potential neighborhood division and diminished property values associated with elevated systems, displacement of truck drivers, or exposure to hazardous/objectionable cargo.

As most of the proposed systems are highly conceptual, there is a long way to go before these systems can be evaluated with any confidence.

VII. Rail Shuttle Economics

Overview of Cost Estimates

This analysis draws on standard railroad costing techniques and rules-of-thumb to estimate the operating cost per container for a rail shuttle service linking the ports with a terminal in the Inland Empire. These estimates should not be regarded as precise or definitive, as there are many potential variations in actual operations that would affect costs. Moreover, there are virtually no precedents for short-haul intermodal operations of this type. The estimates developed below should be regarded as guidelines for relative rail and truck costs, as indications of how cost might vary with volume, and as indications of potential subsidy requirements.

All estimates assume 5-day service, 260 working days per year, 2 roundtrips per 24 hours from both LA and LB to Mira Loma, Ontario and Fontana.

Terminal Lift Costs

The rail shuttle operation will incur costs for lifting container on and off the rail cars at the port, and at the inland terminal.

The rates charged by terminal operating companies for loading and unloading at on-dock rail facilities vary widely, and most are contained in confidential contracts. Since some of the largest terminal operating companies are owned by their ocean carrier "customers" (e.g. Eagle Marine, owned by APL, and APM Terminals, owned by Maersk), information on the actual rate charged is closely held. The study team used estimates published in previous studies of $90 per lift.

Exhibit 27 provides estimates of inland rail terminal operating costs, based on a 70-acre terminal and three different annual lift volumes.

Exhibit 27: Inland Rail Terminal Cost Estimates

Cost Category	Case 1	Case 2	Case 3	Comments and Cost Factors
Volume	26,000	52,000	135,200	
Mangement	1	2	4	
Lift Labor	4	6	10	$ 20/Hour
Clerical Labor	3	5	8	$ 15/Hour
Mechanical Labor	1	2	4	$ 25/Hour
Lift Machines	1	2	4	Side loaders, Mixed new/used
Yard Tractors	2	4	9	Mixed new/used
Switch Engine	1	1	1	Owner function (could be contractor)
Crews	1	2	2	Shifts per day
Acres	70	70	70	Purchase total acrage at start
Land	$ 17,500,000	$ 17,500,000	$ 17,500,000	$250,000 per acre
Construction	$ 6,500,000	$ 13,000,000	$ 33,800,000	$500K per acre and 2000 lifts per acre
Estimates				
Contractor's Lift Rate	$ 23.77	$ 22.70	$ 19.71	
Gate Cost per Lift	$ 9.24	$ 6.16	$ 7.37	
Owner Operating Cost	$ 15.47	$ 14.35	$ 5.98	Mainly the switch engine
Annual Facility Cost	$ 26.37	$ 26.37	$ 26.37	Construction
Annual Land Cost	$ 67.31	$ 33.65	$ 12.94	Return on land
Total Annual Cost per Lift	$ 142.16	$ 103.23	$ 72.37	
Average Operating Cost per Lift	**$ 48.49**	**$ 43.21**	**$ 33.06**	

The three different average costs per lift correspond to the volume scenarios and are used in the overall cost estimates below. Note that each round trip requires two lifts: a loaded lift off on arrival inland, and a lift on for return to the ports.

Rail Line Haul and Switching Costs

Exhibit 28 shows the rail line distances from the Ports to various Inland Empire points used for analysis.

Exhibit 28: Rail Distances

	Los Angeles	Long Beach
To Mira Loma	128	128
To Ontario	112	112
To Fontana	185	182

Exhibit 29 and Exhibit 30 show the requirements and costs for double-stack rail cars at various train capacities. TTX is a car pooling organization owned by the major railroads, and supplies most cars used in U.S. intermodal service. TTX charges by the day and by the mile, allowing the shuttle operation to vary car supply as needed.

Exhibit 29: Rail Car Requirements

	Assuming all double stack, 5 platforms per car:	
Containers Per Train	**# of Cars Per set**	**Total # of Cars**
50	5	15
100	10	30
200	20	60

Exhibit 30: TTX Rail Car Costs

TTX Double-Stack Car Costs	
Per Car Per Day	Per Mile
$ 48.00	$ 0.075

Exhibit 31 shows locomotive requirements. Locomotive costs included the following assumptions.

- Locomotive cost was assumed to be $2,500,000 per unit
- Ownership cost was based on the replacement cost at 7% interest rate and 15-year depreciation life.
- Locomotive maintenance cost was assumed at $50,000 per locomotive per year.
- Fuel Cost was calculated based 8 operating hours per locomotive per day, 14 gallons consumption per locomotive per operating, hour, $2.50 per gallon.

Exhibit 31: Locomotive Requirements

Containers Per Train	Locomotives for 3 Train Sets
50	4
100	6
200	8

A total of four 2-person crews were required for two roundtrips every 24 hours (Exhibit 32).

Exhibit 32: Annual Rail Crew Costs

Crew	Annual Salary and Benefits	
Engineer	$	120,000
Conductor	$	100,000
Crew Total	**$**	**220,000**

Maintenance of Way (track) cost was estimated $1,000 per track mile, an industry standard, and pro-rated across the container volume. Other costs, including overhead, loss and damage, etc., were estimated at 6% of the total container cost.

Exhibit 33 gives the overall rail line-haul estimates at three mark-up levels: a low revenue/cost ratio of 1.5, a high ratio of 2.0, and a mid-range average. The average of the mid-range 100-unit estimates in Exhibit 33 is $168.10.

Exhibit 33: Rail Line-Haul Cost Estimates

Los Angeles				
Units Per Roundtrip (All Double Stack, 5 Platforms Per Car.)				
UP - Mira Loma		**Low (R/C:1.5)**	**Mid-Range**	**High: (R/C:2.0)**
	50	**$205.44**	**$239.68**	**$273.92**
	100	**$146.81**	**$171.28**	**$195.75**
	200	**$106.24**	**$123.95**	**$141.66**
UP - Ontario				
	50	**$204.37**	**$238.43**	**$272.49**
	100	**$146.27**	**$170.65**	**$195.03**
	200	**$105.98**	**$123.64**	**$141.31**
BNSF - Fontana				
	50	**$209.24**	**$244.11**	**$278.99**
	100	**$148.72**	**$173.50**	**$198.29**
	200	**$107.20**	**$125.06**	**$142.93**
Long Beach				
Units Per Roundtrip (All Double Stack, 5 Platforms Per Car.)				
UP - Mira Loma		**Low (R/C:1.5)**	**Mid-Range**	**High: (R/C:2.0)**
	50	**$205.39**	**$229.35**	**$253.31**
	100	**$146.78**	**$163.90**	**$181.02**
	200	**$106.24**	**$118.64**	**$131.03**
UP - Ontario				
	50	**$204.32**	**$228.15**	**$251.99**
	100	**$146.25**	**$163.32**	**$180.38**
	200	**$105.96**	**$118.33**	**$130.69**
BNSF - Fontana				
	50	**$209.00**	**$233.38**	**$257.76**
	100	**$148.60**	**$165.93**	**$183.27**
	200	**$107.14**	**$119.64**	**$132.14**

Exhibit 34 provides a comparable estimate for port-area switching costs.

Exhibit 34: Port-Area Switching Costs

Units per Train	Cost per Unit
50	$ 26.68
100	$ 13.34
200	$ 6.67

Total Rail Shuttle Operating Costs

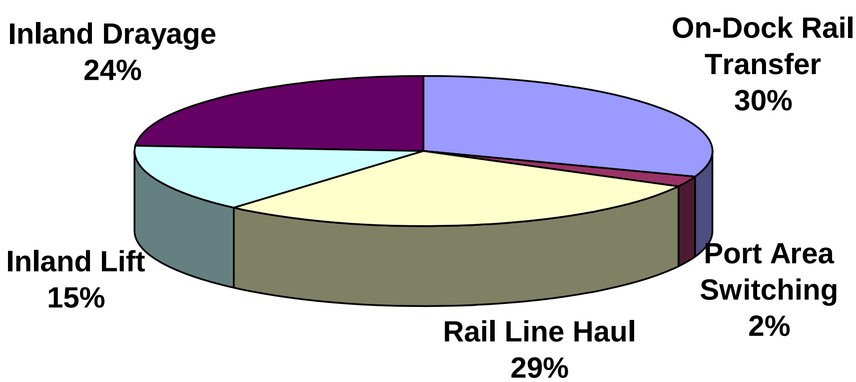
Exhibit 35 summarizes the cost categories discussed above for 100-container trains. Comparable results were obtained for 50-container and 200-container trains.

Exhibit 35: Total Inland Empire Rail Shuttle Cost per Container – 100-Container Trains

Item	Inbound	Outbound	Total
On-Dock Rail Transfer	$ 90.00	$ 90.00	$ 180.00
Port Area Switching	$13.34		$ 13.34
Rail Line Haul	$168.10		$ 168.10
Inland Lift	$ 43.21	$ 43.21	$ 86.41
Inland Drayage	$140.00		$ 140.00
Round-Trip Total			**$ 587.85**

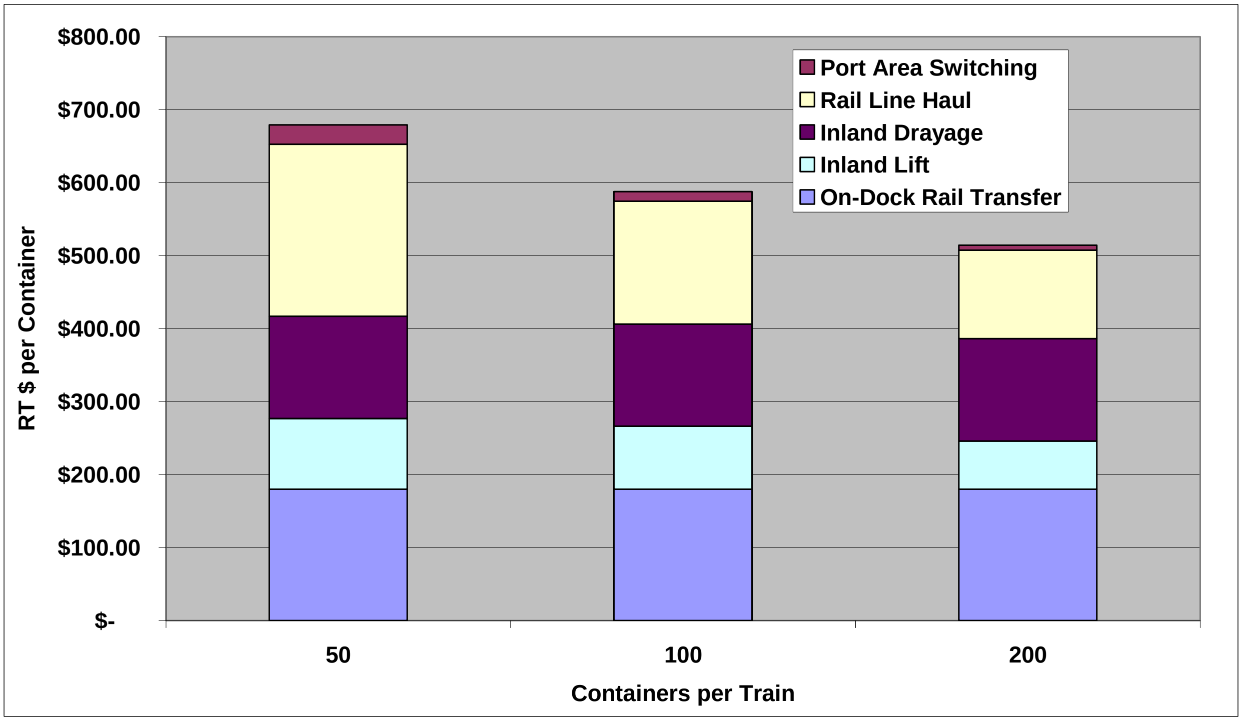
As Exhibit 36 illustrates, the rail line haul cost is less than 30% of the total operating cost. Over 70% of the cost is in lift-on/lift-off at marine or inland terminal, ports area switching, and inland drayage. When these costs – totaling over $400 – are spread out over a 2,000 cross-country line haul, rail intermodal service is not only competitive but less costly than truck. Over the 60-mile trip to the Inland Empire, however, it is impossible to be directly cost-competitive with truck.

Exhibit 36: Rail Shuttle Cost Shares – 100-Container Trains



The on-dock and drayage costs exhibit no economies of scale (Exhibit 37), so the composite cost does not decline appreciably with volume.

Exhibit 37: Total Rail Shuttle Cost Comparison – RT $ per Unit



Rail-Truck Comparisons and Operating Subsidies

Exhibit 38 compares rail costs for three train sizes with estimated truck drayage costs.[4] Note that drayage cost estimates vary considerable depending on the customer's volume commitment, current operating conditions, fuel surcharges, etc. As the comparison indicates, however, the gap between truck and rail shuttle costs is large – $200 to $300 for larger train sizes, and even more at start-up levels. Small variations in either cost estimate would have little impact on the overall comparison.

Exhibit 38: Rail Shuttle and Truck Costs for Inland Empire Round Trips

	RT Cost
50-container train	$ 679.18
100-container train	$ 587.85
200-container train	$ 514.33
Truck	$ 300.00

The operating subsidy required to divert truck trips to the rail shuttle would be determined by the cost gap in Exhibit 38. The estimates suggest that the required subsidy would be at least $200 per container at current cost levels. The 100-container train scenario would move 50,000 round trips per year (2 round trip trains per day, 250 days per year), and would require a nominal annual subsidy of $14.4 million at a unit cost difference of $287.85 per unit.

[4] From San Pedro Bay Ports Clean Air Action Plan, Economic Analysis; Husing, Brightbell, and Crosby, September 2007

Increasing truck costs due to the Port's Clean Truck Plans (CTP) could narrow the cost differential and thus reduce the subsidy requirements. Analysis of likely trucking cost impacts yields the comparisons in Exhibit 39.

Exhibit 39: Truck Cost Scenarios and Subsidies

Impact Source	*Inland Empire Truck Cost*[5]	*Nominal Subsidy per Unit*	*Annual Subsidy for 50,000 Units*
Current	$300	$287.85	$14.4 million
TWIC	$373	$214.85	$10.7 million
TWIC + LMC/IOO CTP	$446	$141.85	$7.1 million
TWIC + Employee CTP	$540	$47.85	$2.4 million

The Transportation Worker's Identification Card (TWIC) requirement is expected to increase labor costs. The Clean Truck Plan (CTP) with Licensed Motor carrier/Independent Owner-Operator (LMC/IOO) or Employee driver options would increase both labor and capital costs further. At the extreme, the annual subsidy for 50,000 units on a rail shuttle might be reduced from $14.4 million at current price levels to $2.4 million. These comparisons must be approached with caution, however, as the estimated impacts of drayage industry changes are highly uncertain and the same changes may also increase the cost of inland drayage for the rail shuttle operation.

[5] Ibid.

VIII. Inland Empire Terminal Analysis

Barriers to Conventional Terminals

There appear to be no opportunity to create a conventional large-scale rail intermodal terminal in the central part of the Inland Empire. BNSF, as noted earlier, spent several years searching for sites without success. The study team reviewed BNSF's findings, examined maps and aerial photos, and consulted regional planning agencies with the same result; there are no suitable rail-served parcels for a conventional rail intermodal terminal in the central part of the Inland Empire. Most rail-accessible property along UP or BNSF lines has already been developed, although most adjacent land uses are not rail-related.

Large parcels somewhat removed from the rail lines would be attractive and suitable, but would need rail connections built through developed areas. The need to build rail connections, and the resulting community opposition, are formidable obstacles to terminal development. The difficulty of connecting a new site to the existing network was the major stumbling block for BNSF's effort to establish a new terminal near SBIA.

Public agency stakeholders in this project have enquired if there would be a value in efforts to assemble a large parcel as an economic development or redevelopment initiative. The answer may be "yes," but not solely for an inland port. Large intermodal terminals are built to accommodate multiple intermodal origins and destinations, and often for a mix of domestic and international business. There would likely be a significant benefit to an additional large intermodal terminal in the Inland Empire, which explains the ongoing interest of BNSF and UP. The most apparent benefits would be in a reduction of truck VMT currently incurred between UP intermodal terminals in Los Angeles (City of Commerce, LATC) and the Inland Empire. A BNSF facility would reduce the need for drayage to and from Hobart or, in the future, Victorville. If such a facility were developed, part of its capacity could be used for a port rail shuttle.

Rail intermodal terminals are low-value land uses, however, creating an economic obstacle to redevelopment efforts. Industry experience and Tioga Group analysis in other projects indicates that rail intermodal terminals return little or no revenue on the land itself. Railroads supply or purchase the land, but earn the revenue on the line-haul service. Rail intermodal terminals are operated by specialized contractors who are paid by the lift but who do not own or lease the land. Efforts to develop rail intermodal terminals as private money-making ventures have been generally unsuccessful, as is documented in the Case Studies Appendix. The few successful private terminals serve as the core of logistics parks, not as standalone businesses.

This consideration implies that a large intermodal terminal initiative would have a difficult time justifying assembly of large parcels, or competing to use such large parcels as become available. In the rising Inland Empire real estate market, a 100–300 acre commercially zoned parcel could cost $100 million to $300 million.

While there are no near-term candidates, there may be some long-term possibilities.

- Union Pacific (and its predecessor Southern Pacific) has periodically investigated the possibility of using or reconfiguring its land and facilities around the West

Colton yard to develop an intermodal terminal. The proposed demonstration shuttle train project in cooperation with ACTA would have used a small intermodal terminal at Colton built for the purpose. The study team incorporated this small-terminal concept as a possibility in Inland Empire site selection. The possibility of a large intermodal terminal at Colton is more remote, however, and could be further diminished by the Colton Crossing line separation project.

- The quarry currently operating west of Colton will likely be depleted and close within the next decade. Closure of this operation could conceivably make a large parcel available as an intermodal terminal site. Suitability of this site would depend on its post-closure condition, size, and configuration. Intermodal terminals are good uses for "brown field" sites with environmental remediation issues since terminals are almost entirely paved or covered with gravel and tracks. Intermodal terminals must be level, however, and rolling terrain suitable for housing would not facilitate intermodal development. A large issue is whether the entire site remains intact until closure and sale or is sold off and developed in stages.

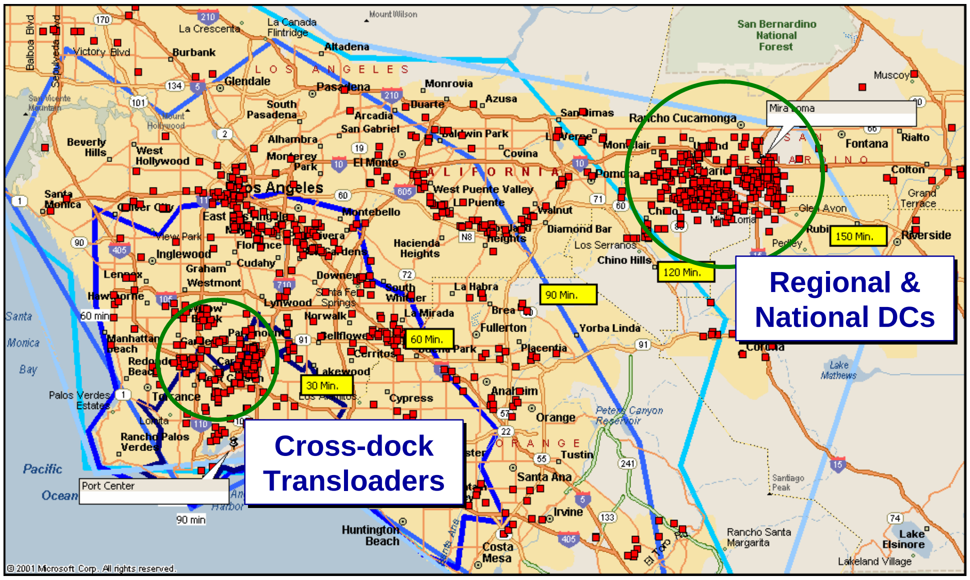
Commuter-Style Terminal Approach

Rather than looking for large, multi-purpose terminal sites that do not exist, the study team began looking for commuter-style inland terminal sites that could accommodate just the rail shuttle trains. The major issues to be addressed are:

- Rail and terminal capacity
- Commercial acceptance
- Public investment and subsidy
- Site selection close to existing customers

The Mira Loma concentration of distribution centers and other customers is the key near-term target market to reduce VMT. That is where the Inland Empire distribution centers are clustered (Exhibit 40), and the closer the terminal is to the center of that cluster the more truck VMT can be saved.

Exhibit 40: Mira Loma Concentration of Regional and National DCs



As the port survey data show, Mira Loma is really the major concentration of existing customers outside of the immediate port area (Exhibit 41).

Exhibit 41: Current Markets: Daily 2005 Trips

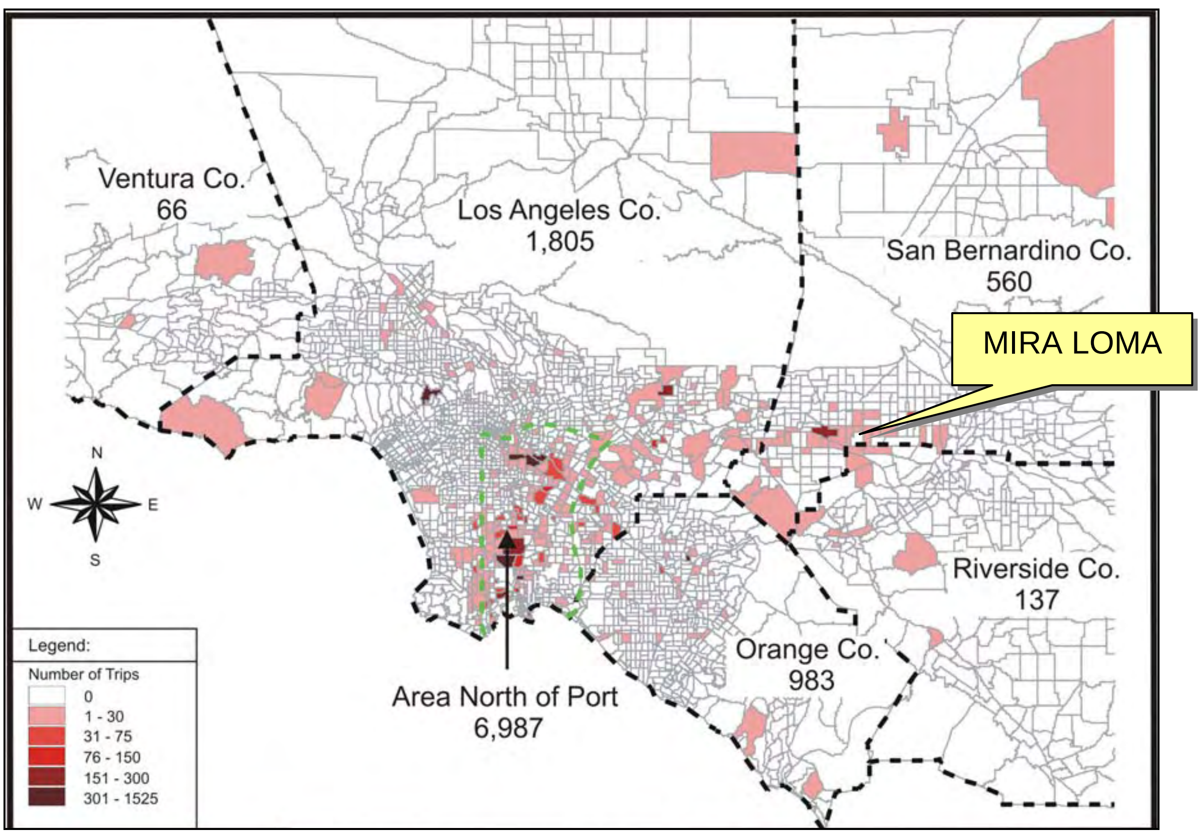


Exhibit 42: Large Inland Empire Sites: Colton, SBIA, SCLA

Model runs confirm that net VMT can be reduced using sample sites, and that the closer Mira Loma the better the results. The MMA model demonstrates substantial VMT reductions for the Colton and SBIA locations, and modest reductions for the SCLA location (Exhibit 42 and Exhibit 43).

Exhibit 43: Truck Model Findings for Large Inland Empire Sites

Year 2005

Year 2005	VMT Estimates				Difference			Percent Difference		
	Without Inland Port	Colton	SBIA	SCLA	Colton	SBIA	SCLA	Colton	SBIA	SCLA
AM Peak Hour	126,465	120,302	121,236	125,993	(6,163)	(5,229)	(472)	-4.87%	-4.13%	-0.37%
MD Peak Hour	190,198	180,811	182,178	189,268	(9,387)	(8,020)	(930)	-4.94%	-4.22%	-0.49%
PM Peak Hour	119,825	114,180	115,103	119,434	(5,645)	(4,722)	(391)	-4.71%	-3.94%	-0.33%
AADT*	1,865,333	1,774,756	1,788,534	1,857,671	(90,577)	(76,799)	(7,662)	-4.86%	-4.12%	-0.41%

** AM, MD, and PM Peak Hours are 23.4 percent of daily port trips in 2005*

Year 2010

Year 2010	VMT Estimates				Difference			Percent Difference		
	Without Inland Port	Colton	SBIA	SCLA	Colton	SBIA	SCLA	Colton	SBIA	SCLA
AM Peak Hour	162,263	155,130	156,103	161,183	(7,133)	(6,160)	(1,080)	-4.40%	-3.80%	-0.67%
MD Peak Hour	222,142	211,746	213,348	221,154	(10,396)	(8,794)	(988)	-4.68%	-3.96%	-0.44%
PM Peak Hour	134,115	128,039	128,943	133,418	(6,076)	(5,172)	(697)	-4.53%	-3.86%	-0.52%
AADT	2,541,765	2,426,054	2,443,108	2,528,211	(115,711)	(98,657)	(13,554)	-4.55%	-3.88%	-0.53%

** AM, MD, and PM Peak Hours are projected to be 20.4 percent of daily port trips in 2010*

Terminal Site Selection

Search criteria for a commuter-sized terminal include the following:

- Minimum size of 35 acres. Provides minimum capacity for a terminal of at least 100,000 lifts, approximately 8% of 2005 port market share for Riverside and San Bernardino Counties.

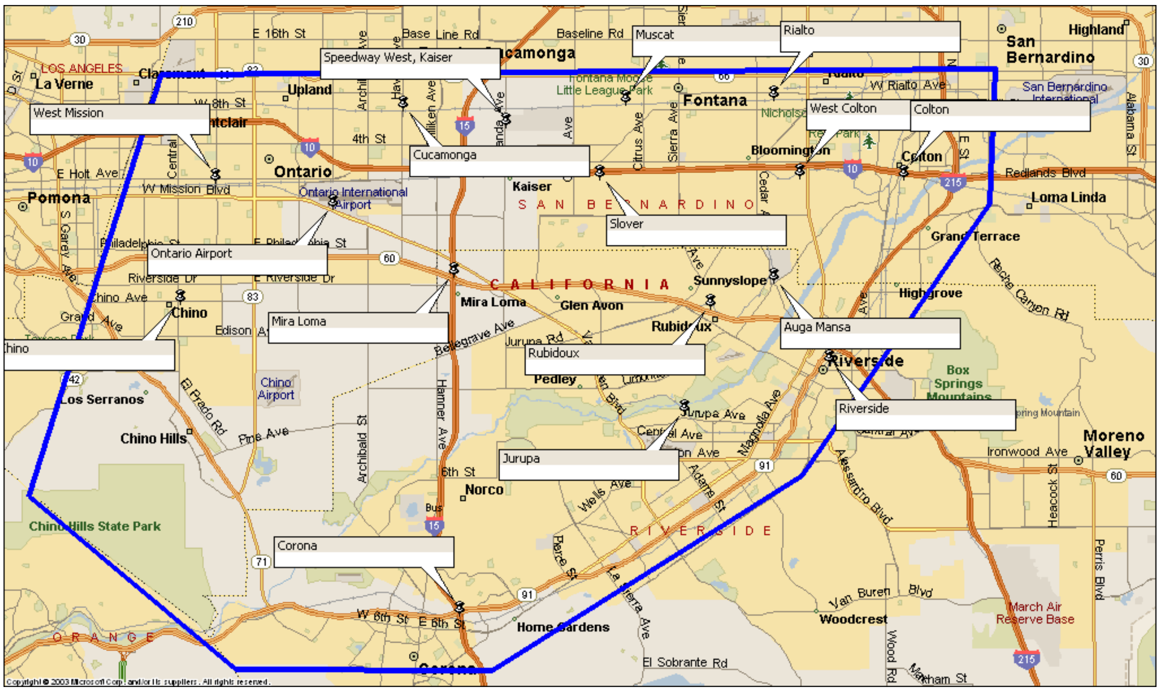
- Properly zoned. Zoning and land use generally conform to the potential market for the prospective service.

- Clear rail access.

- Able to be efficiently developed or re-developed

"Commuter-sized" terminal sites do exist. The team checked 16 industrial areas surrounding Mira Loma and found a number of candidate sites (Exhibit 44).

Exhibit 44: Sites with Rail Access in 16 Industrial Areas



The sites are listed in Exhibit 45 from nearest to farthest from Mira Loma.

Exhibit 45: Industrial Area Characteristics

Area	Line	Interchange	Miles and Minutes to Mira Loma	
Mira Loma	LA Sub-Eastbound	I-15, CA-60	0	0
Ontario Airport	LA Sub-Eastbound	I-15, CA-60	4.4	8
Kaiser	BNSF North	I-10, Etiwanda	6.6	12
Cucamonga	BNSF North	I-10, Haven	5.9	13
Slover	Alhambra Sub-Westbound	I-10, Cherry	8.1	16
Chino	Chino Branch	CA-60, Central	9.7	17
W. Mission	Alhambra Sub-Westbound	CA-60, Mountain	9.2	18
Rubidoux	Crestmore Branch	CA-60, Valley Way	9.3	20
Jurupa	LA Sub-Eastbound	CA-91, Central	9.0	21
W. Colton	Alhambra Sub-Westbound	I-10, Riverside	14.6	22
Muscat	BNSF North	I-10, Cherry	11.6	23
Corona	BNSF Main	I-15, CA-91	15.8	24
Auga Mansa	Crestmore Branch	CA-60, Rubidoux	16.4	25
Colton	Alhambra Sub-Westbound	I-10, Mt. Vernon	17.3	25
Riverside	BNSF South	CA-60, CA-91	13.5	26

The study team used maps, zoning diagrams, and aerial photos from Google Earth. Most of the sites were also field checked. The team also conducted an internet search for commercial and zoning information. Where possible, the project team contacted the appropriate planning agencies to verify the availability and suitability of these sites. The one message that comes through consistently is that the public sector has a limited window of time before these sites are taken for potential uses.

The three highest-ranked sites from Exhibit 45 are discussed below.

Mira Loma Site and Zoning

There is one potential site on the UP in the middle of the Mira Loma area in the 3.5 miles along UP between Philadelphia Street and Belgrave Ave. The site consists of 53 acres at Etiwanda and Iberia. Nearby major UP facilities include:

- Mira Loma auto distribution center
- Mira Loma Yard – support yard for rail-served warehouses

The quote below is an excerpt from the applicable land use regulations.

Require that in the Business Park, Light Industrial, and Heavy Industrial land use designations within the Jurupa Area Plan, warehousing and distribution uses, and other goods storage facilities, shall be permitted only in the following area: the area in Mira Loma defined and enclosed by these boundaries: San Sevaine Channel from Philadelphia Street southerly to Galena Street on the east, Galena Street from the San Sevaine Channel westerly to Wineville Road on the south, Wineville Road northerly to Riverside Drive, then Riverside Drive westerly to Milliken Avenue, then Milliken Avenue north to Philadelphia Street on the west, and Philadelphia Street easterly to the San Sevaine Channel on the north….No warehouses, distribution centers, inter-

modal transfer facilities (railroad to truck), trucking terminals or cross dock facilities shall be allowed outside of the aforementioned area.

This provision clearly prohibits intermodal terminals outside the area shown in Exhibit 46 in yellow.

Exhibit 46: Mira Loma Site

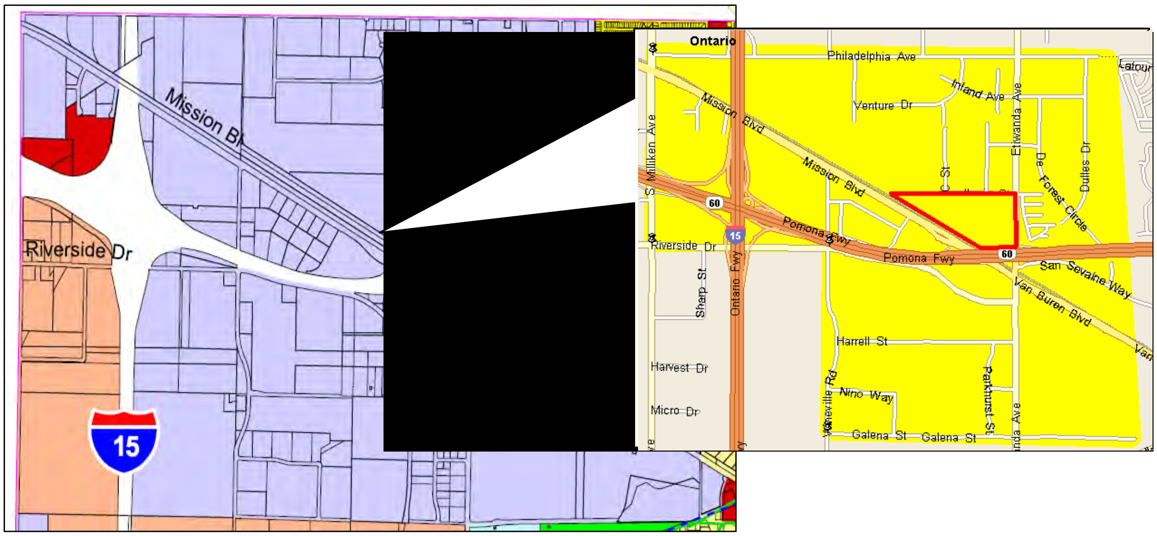


Exhibit 47 provides an aerial view of the site.

Exhibit 47: Space Center Mira Loma Site – Aerial Photo

The site is adjacent to the UP and owned by the Space Center of Mira Loma. The Space Center has no current tenants on that parcel but expects to develop it in the next 3 to 5 years. This and other sties are going fast.

Exhibit 48 and Exhibit 49 provide additional aerial and ground-level views of the site.

Exhibit 48: Mira Loma Site in Context

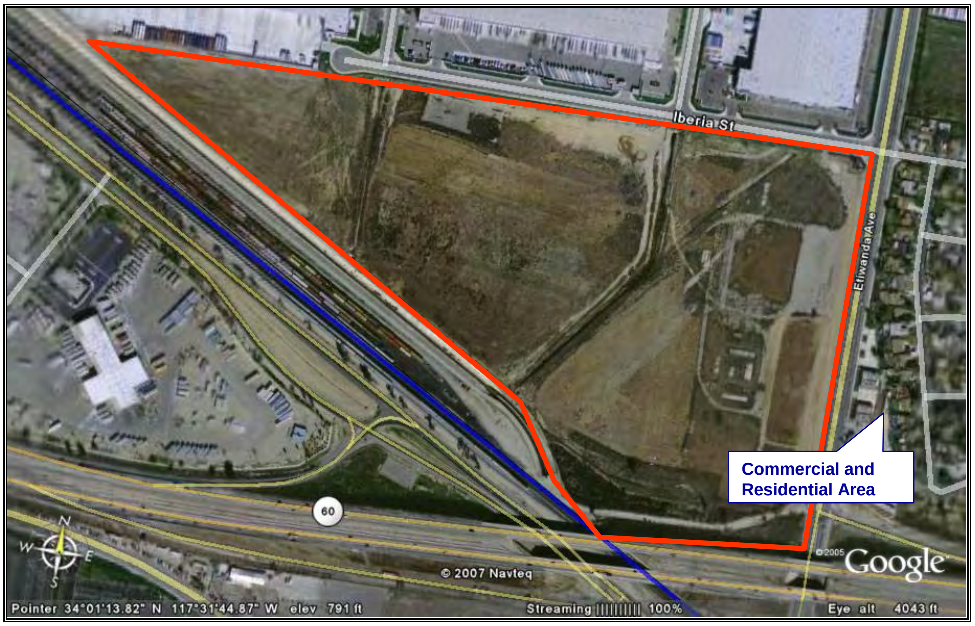


Exhibit 49: Mira Loma Space Center Site - Ground Level View

Although ideally located near the center of the Mira Loma distribution industry cluster this site illustrates many of the problems faced in existing development areas. The site is very close to the freeways, but entrance and exit ramps are legacy structures and not well suited to heavy truck traffic to and from the site. The site is zoned commercial and (apparently) suitable for an inter-modal rail terminal, but is directly across Etiwanda Ave. from a small residential area. Adjacency to residences would be a major problem for night and early morning operations, as well as frequent truck movements.

This is the best site that the team could locate in the Mira Loma area. The location would maximize VMT savings but obviously raises significant community acceptance issues. Moreover, as noted above, it will likely be developed for distribution facilities in the next 3 to 5 years, leaving a very brief time span for potential public sector development as an inland port terminal.

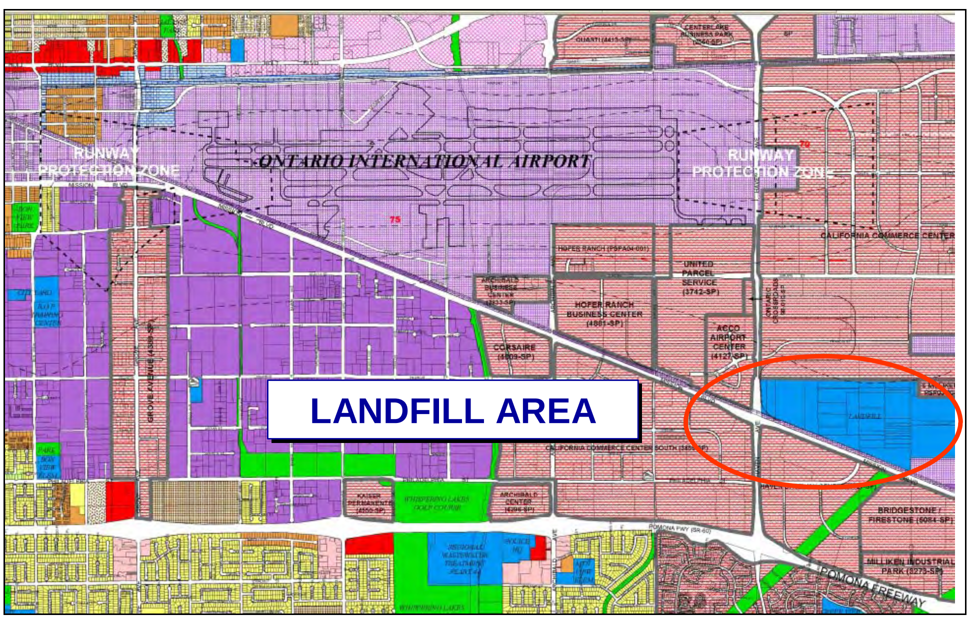
Ontario Airport Site and Zoning

The Ontario Airport is near the center of the target market. As Exhibit 50 shows, there is a former landfill area southeast of the airport, along Mission Blvd. This site is of sufficient size and has the required rail and highway access to serve as an inland port terminal. The site is adjacent to the Union Pacific Line and is located between the SR60, I10, and I15 with access from Haven Ave.

The site is a mile south of the Runway Protection Zone on the east and of the Ontario Airport, in an area already subject to late night and early morning flight activity. The nearest residential areas are on the other side of the Pomona Freeway (SR91) and would not be directly affected. The East Ontario Metrolink station is just west of the site.

Exhibit 51 shows several vacant parcels near the site, suggesting the potential for new logistics-related customers that could benefit from inland port operations.

Exhibit 50: Ontario Airport Site Zoning



The land use pattern south of the airport suggests developing an inland port and associated DCs in the area.

Exhibit 51: Ontario Airport Site - Aerial View

The landfill site is reportedly zoned PF – Public Facility, which would be favorable for development of an inland port terminal. The site, however, is not level, being a landfill. Leveling the site for use as an inland port terminal may involve moving the landfill, an impractical proposition.

Kaiser/California Steel Site

The third example is the former Kaiser Steel site, which is now California Steel Industries (Exhibit 52). Key features of the overall site include:

- About 6 square miles of mixed zoned property (mainly industrial) in Ontario, Fontana, and Rancho Cucamonga.
- Accessible from the UP Alhambra and the BNSF north lines.
- Former Kaiser Mill now California Steel Industries is a major land owner.

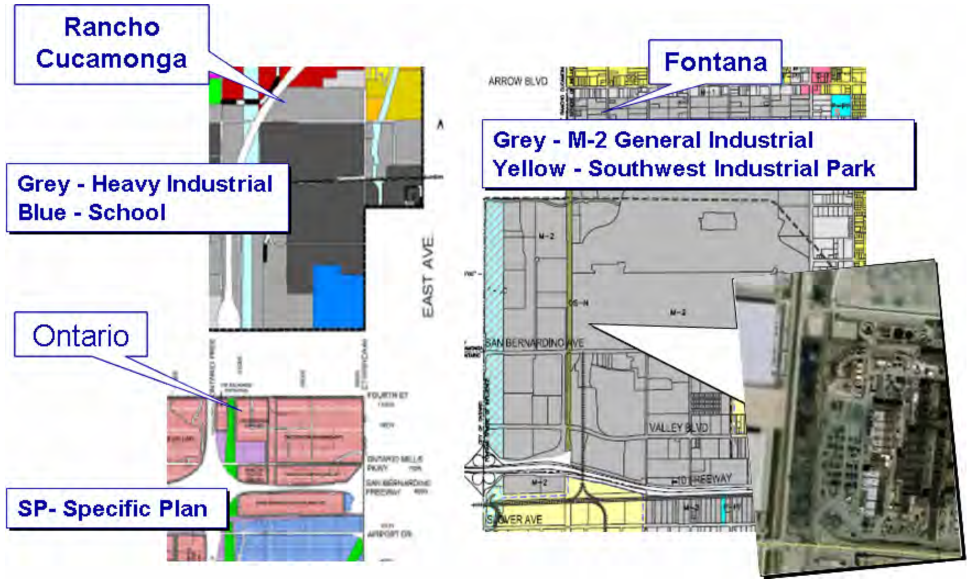
Approximately 50 acres adjacent to the California Steel Plant are suitable as an inland port terminal.

Exhibit 52: California Steel Site

This site overlaps city boundaries. The candidate location within the site is in Fontana in an area zoned M-2 General Industrial, as shown in Exhibit 53.

- Ontario Zoning: SP Specific Plan
- Fontana Zoning: Grey Area, M-2 General Industrial; Yellow Area, Specific Plan, Southwest Industrial Park
- Rancho Cucamonga zoning: Grey Area-Heavy Industrial, Blue Area-School

Exhibit 53: California Steel Area Zoning



The location is served by a rail line that connects with BNSF on the north and UP on the south. The site consists of approximately 50 acres adjacent to California Steel Plant and is currently used for open storage of steel products. Another nearby site that was considered earlier in the project, shown here as the West Speedway site, is no longer available.

Exhibit 54: California Steel Site - Aerial Photo

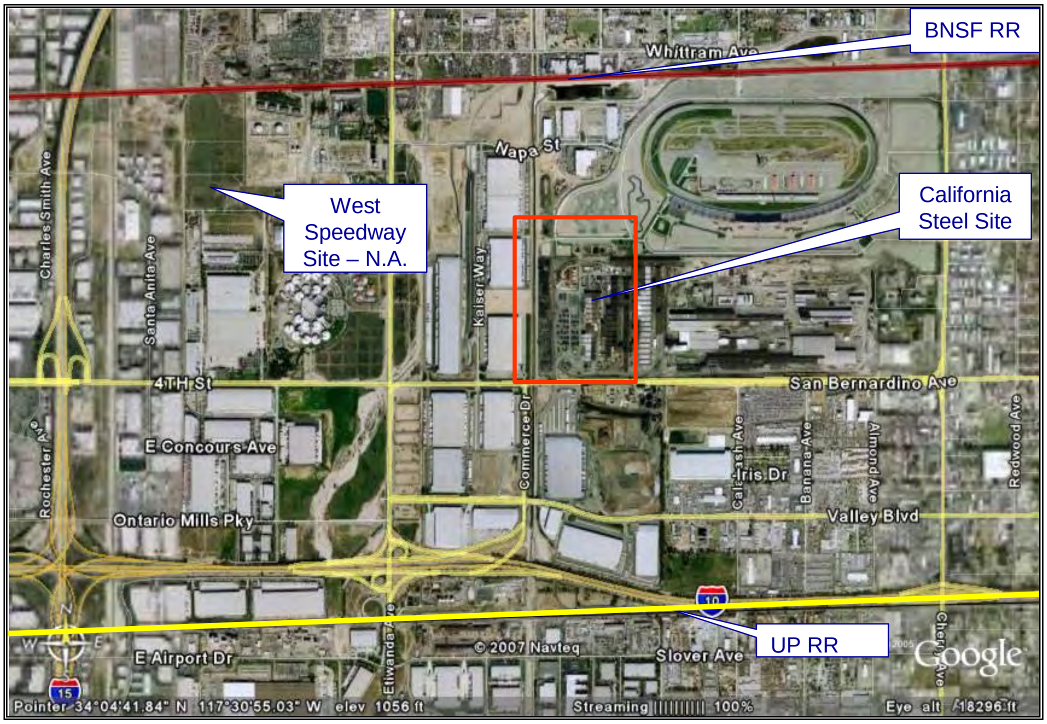


Exhibit 55 shows the rail access to the California Steel site.

Exhibit 55: Rail Access to California Steel Site

Community Acceptance/Opposition

The sites discussed in this chapter all face serious issues of community acceptance.

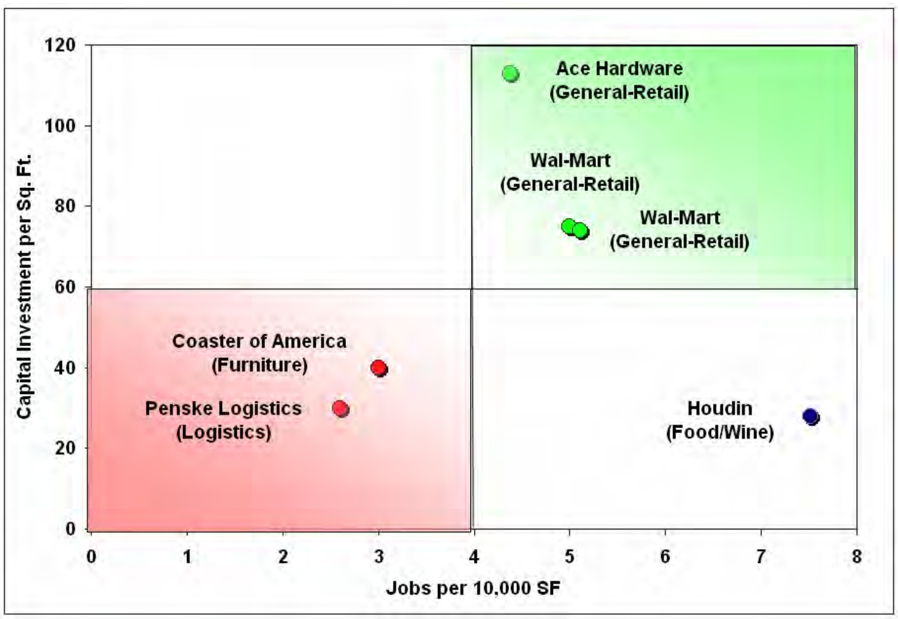
Much of the central Inland Empire has a legacy mix of residential, commercial, and industrial land uses. In unincorporated areas, which include much of Mira Loma, proximity of new distribution facilities and older residential neighborhoods has created acute sensitivity to truck and rail traffic.

Meetings with representatives of County Supervisors, RCTC, and SANBAG confirmed the extreme social and political sensitivity to additional truck traffic in the Mira Loma area in specific.

As observed in the site selection discussion there are relatively few open industrial sites left in the central portion of the Inland Empire. Communities and regional planning agencies are placing a high priority on the number and quality of jobs to be generated by development of the remaining sites.

As Exhibit 56 below suggests, new distribution facilities typically generate 2-6 jobs per 10,000 square feet.

Exhibit 56: Job Density of Logistics Developments



Source: Economic Planning Systems – Sacramento Area Data

Distribution facilities may have floor area ratios of about 0.5, meaning roughly that half the site is covered by a single-story building. A typical value of 4 employees per 10,000 square feet from Exhibit 56 would therefore become the equivalent of about 9 employees per acre.

In contrast, a 35-acre rail intermodal facility is likely to employ no more than 10-12 people, giving a ratio of about 0.33 per acre. (The drayage drivers would not be counted, since they are not employed at the terminal and would actually have more work without an inland port.)

Developing an inland port facility on one of the few empty sites in the Mira Loma area would therefore run counter to the highest priorities of regional and local planning agencies.

The inland port concept has already met with strong community opposition. The Center for Community Action and Environmental Justice (CCAEJ) based in Riverside, has convened community meetings to oppose the idea of an inland port and prepared media articles opposing the idea – even though there is no current inland port proposal. While the actions or opinion of a specific community group may not be decisive, or perhaps even representative, the existence of organized opposition in advance of any actual proposal is indicative of high community sensitivity.

Based on potential opposition from county and regional planning agencies, and active opposition from at least one permanent community group, there appears little chance for community acceptance of an inland port terminal in the central Inland Empire.

IX. Additional Terminal Sites

Logistics Parks as Inland Ports

Extending the inland port concept beyond the central Inland Empire requires a change of strategy or model. The central Inland Empire (e.g. Mira Loma) is an existing market with a base of potential customers already moving containers to and from the ports. The advantages of existing development are the certainty of the market, even though that market may be hard to penetrate, and the potential for near-term project benefits. The disadvantages are the lack of space for a terminal and the inertia faced in attempting to shift modes. Moving beyond the central Inland Empire leaves existing markets behind, and relies instead on new market development.

The "Logistics Park" model would encourage and locate future logistics industry development. Choosing a logistics park site comes down to "location, location, location." The site must have potential for distribution center development, and good rail access. Use of the land as a logistics park has to mesh with other public plans and private initiatives.

The key to success in the Logistics Park model is attracting customers that will use the inland port and rail shuttle from the beginning, rather than attempting to divert established traffic from trucks. The major issues to be addressed are:

- Market potential
- Public vs. private development priorities
- Rail capacity and traffic volume
- Competition with other public and private initiatives
- Site selection and development timeline

The development timeline is critical. Not unlike a passenger transit station, it is preferable to be near the beginning of the development cycle so there is some customer base at the outset, but still in the position to influence future development patterns. Long-term development plans and trends for the SCAG region anticipate growth extending out the I-15 Corridor. Riverside and San Bernardino Counties are the fastest growing sub-regions according to the SCAG Regional Economic Forecast. In 2004, sub-regional employment in Transportation, Warehousing, and Utilities grew 10.7%.

As development progresses beyond Cajon Pass there are two highway junction areas that will become candidates for logistics park developments: Victorville and Barstow.

Victor Valley

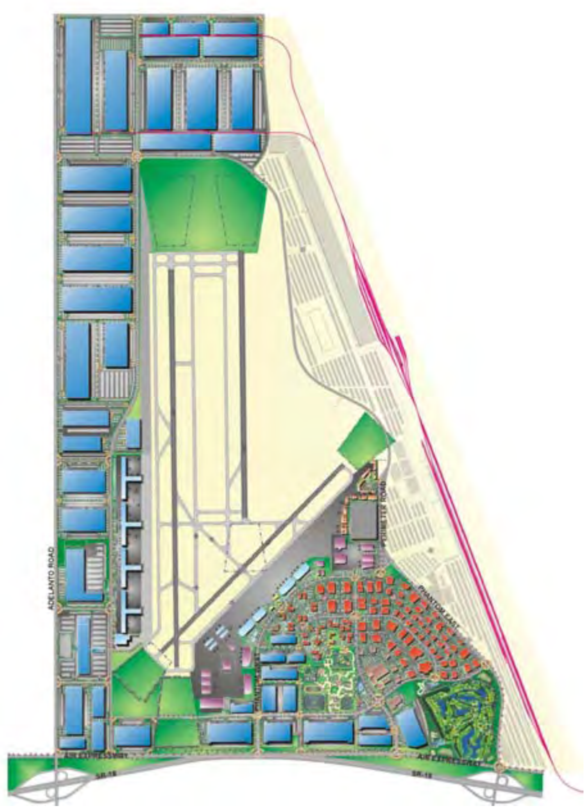
The Victorville area – broadly including the communities of Victorville, Apple Valley, Hesperia, and Adelanto – has for some time been considered the next logical focus for distribution activity after the Inland Empire. As Exhibit 57 indicates, the area is roughly defined by the junctions of

Interstate 15, US 395, and State Route 18. The Victorville area is the first substantial metropolitan area north and east of Cajon Pass for both the highway and the railroads.

Exhibit 57: Victor Valley and SCLA Site

The Southern California Logistics Airport (SCLA) at Victorville is an obvious candidate. The SCLA is the former George Air Force Base, being developed by Stirling International into a 4,000-acre master-planned business and industrial airport complex (Exhibit 58).

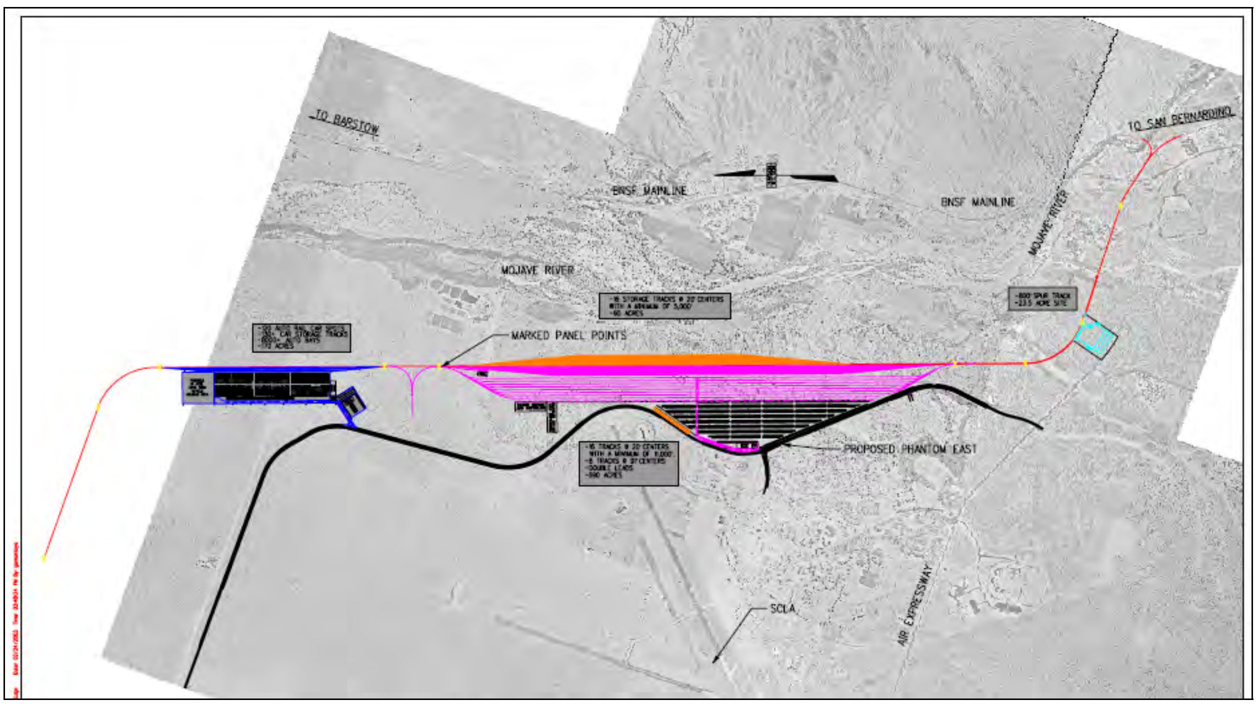
Exhibit 58: Conceptual SCLA Development Plan



Developers of SCLA have envisioned an intermodal rail terminal as part of the development from an early stage. In 2007, BNSF began discussions with SCLA about actually developing such a facility. As noted earlier BNSF has been seeking additional Inland Empire intermodal capacity without success for several years. BNSF has investigated the location and has worked with SCLA to suggest conceptual plans to SCLA that differ from the original conceptual plans shown in many SCLA publications.

The 2003 BNSF preliminary concept is not an inland port terminal designed to handle rail shuttles to and from the San Pedro Bay ports. The concept in Exhibit 59 is a 690-acre conventional intermodal terminal capable of handling multiple trains and traffic flows. As with the existing San Bernardino terminal, an SCLA terminal would likely handle domestic long-haul intermodal traffic to and from points to the north and east. The concept in Exhibit 59 also includes a 170-acre auto loading/unloading facility and a large storage yard serving both terminals. The facility would be accessed on a long spur track from the BNSF mainline. Until such time as it filled up with other business in the distant future, a terminal of this scale could easily accommodate a port rail shuttle. Serving the Victorville area would therefore not require a separate inland port facility.

Exhibit 59: Preliminary Intermodal Terminal Plans for SCLA Site



The Victorville area is a less-than-optimal choice as a rail intermodal terminal for BNSF as it is much farther from the Inland Empire intermodal customer base than the existing San Bernardino terminal.

The major issue with the SCLA site as a near-term “inland port” site is, likewise, its location. Lying north of Cajon Pass, SCLA is not an efficient hub site for trucking to and from Inland Empire port customers. The SCLA site is only 3 miles closer to the Mira Loma area than is the Port of Long Beach, so any VMT savings would be minimal, and would also be offset by the difficulty and cost of trucking up and down Cajon Pass. Any rail shuttle to and from the ports would likewise have to operate over Cajon Pass, a congested and high-cost route.

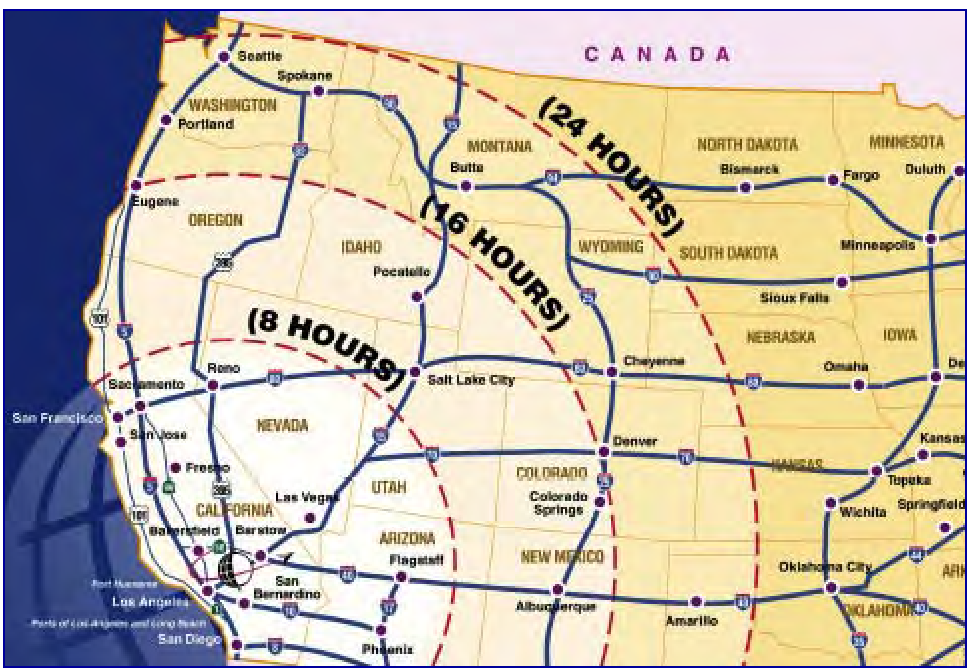
In the long term, as the Victor Valley area develops into a separate market, the SCLA site may become more attractive. As noted above, serving a *developed* area with new intermodal facilities is inherently difficult. Serving a *developing* area such as Victorville allows the customer base to grow up around the facility.

Extension of a rail shuttle service to Victorville would obviously be simplified if and when a BNSF intermodal facility is established there. The key issues facing such an extension are the emergence of demand and rail capacity on Cajon Pass.

Establishment of an intermodal facility at SCLA should encourage development of distribution and manufacturing facilities that utilize intermodal service, but not necessarily those that have large volumes of port container traffic. SCLA is 40 miles farther from the ports than the edge of the existing Inland Empire distribution center cluster (measured from SR 210 at Fontana), adding 80 truck miles or $80-100 to each round trip drayage move and a comparable incremental cost to each rail move. It may be a long time before enough port-oriented distribution facilities locate in or near Victorville to justify a frequent rail shuttle service.

Exhibit 60, which comes from the SCLA website, emphasizes the outward orientation. There might still be some truck trips back into the Inland Empire and the LA Basin, but most of the DCs in the Victorville area would be primarily serving markets beyond Southern California.

Exhibit 60: Outward Orientation of SCLA Site



Barstow

Moving farther out the I-15 corridor, Barstow offers potential as a future logistics park site. A Barstow site would be positioned as a developing logistics park and/or an agile port terminal.

Exhibit 61: Barstow Location

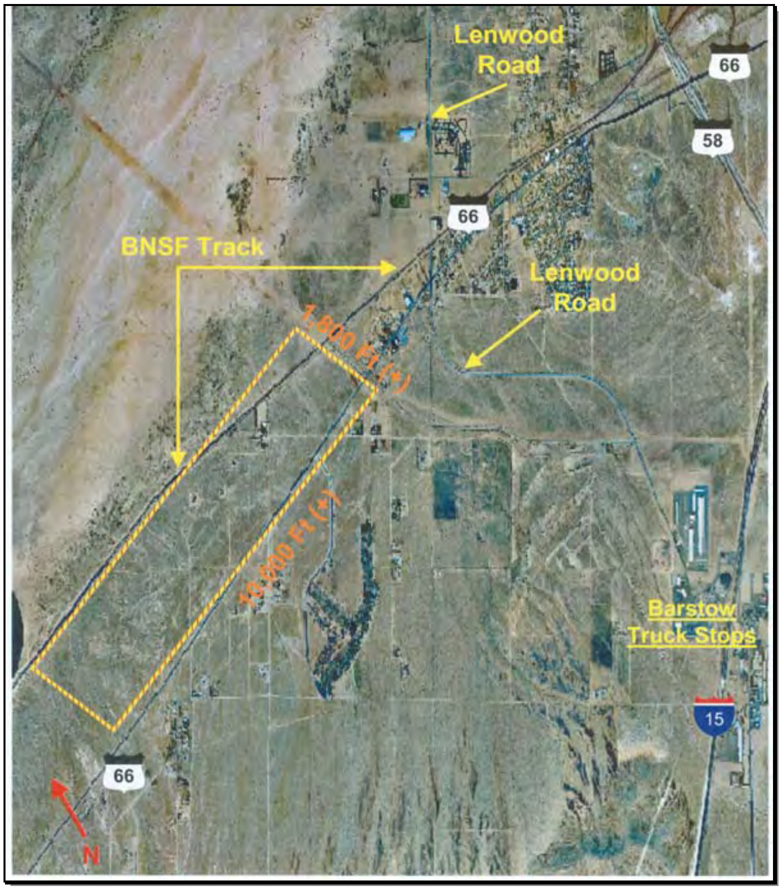
The City of Barstow has identified at least one appropriate site for a rail intermodal facility that could become the nucleus of logistics-related development (Exhibit 61). A potential Barstow site is adjacent to the BNSF mainline with UP trackage rights.

Barstow is experiencing strong economic development trends across a range of commercial and industrial categories. As of June 2007, the economic development office listed over 300,000 square feet of new commercial buildings in progress. The study team is aware of two significant distribution industry initiatives.

- There are advanced plans to develop a Wal-Mart distribution center for food products, including perishables. The Wal-Mart facility would consist of roughly 900,000 square feet on a 143-acre site west of Lenwood Road Exhibit 62, and is expected to open by early 2009. This facility could be expected to receive at least some of its goods from the ports, notably imported produce, foods, and beverages (beer and wine).

- A smaller nearby produce distribution center (85,000 square feet) could also be a potential customer.

Exhibit 62: Proposed Barstow Inland Port Site



A proposed industrial park adjacent to the potential inland port site would cover roughly 1200 acres with buildout between 2007 and 2016. Preliminary plans indicate about 15 buildings, most with rail sidings to accommodate conventional freight cars (rather than intermodal cars). This proposed development would focus on customers and commodities using conventional rail cars but would likely ship and receive intermodal freight as well.

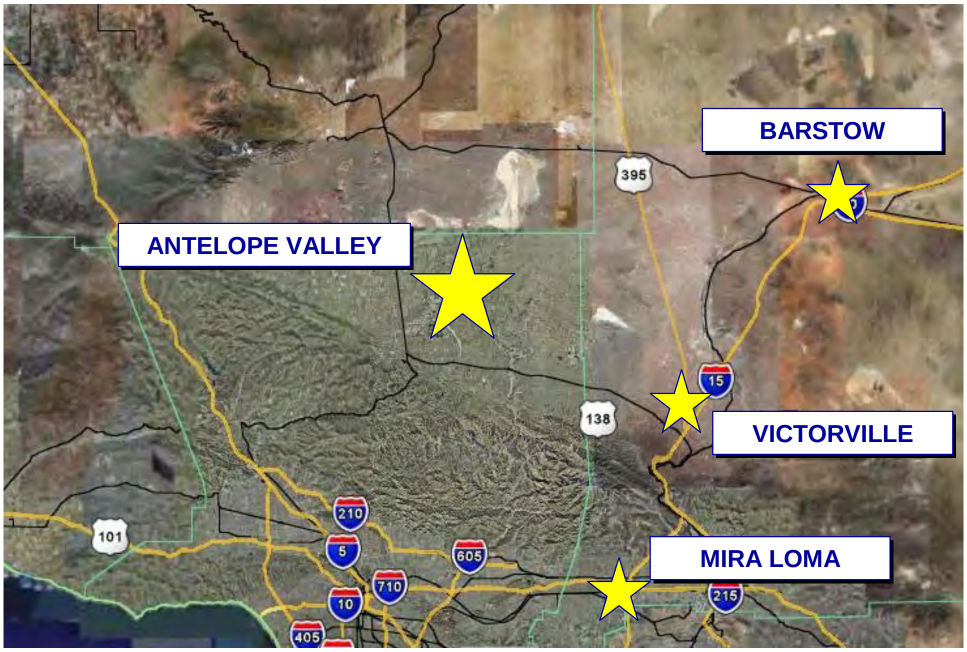
This area is at an earlier point in the development time line. Barstow is established as a rail and truck crossroads, as evidenced by the rail facilities and truck stops. As it emerges as a distribution center location in the future, regional planning agencies may want to link that development with an inland port where possible.

Barstow would also be a logical site to pursue an agile port strategy. The agile port concept calls for port terminals to load as much as possible on rail with a minimum of port-area sorting, and would require a site with abundant space for inland sorting.

Antelope Valley

The Antelope Valley offers two of the things needed for an inland port – rail service and developable land – but is handicapped by geography. Unlike Mira Loma, Barstow, or Victorville which are at major highway junctions, the Antelope Valley is off the major regional truck routes and not well located for near-term distribution functions (Exhibit 63).

Exhibit 63: Antelope Valley Location



The rail line between the Antelope Valley and Los Angeles is a secondary route. The UP line from Palmdale to West Colton (the "Palmdale Cutoff") was actually built in the early 1970s to bypass this older route into Los Angeles.

Development of the Antelope Valley as a distribution hub would be a very long-term proposition, as it would likely depend on significant shifts in regional population and economic development patterns. For the foreseeable future, the Antelope Valley is not in a favorable geographic location to serve either the Southern California population centers or more distant regional markets.

X. Institutional Issues

Ocean Carrier Perspective

A significant portion of the containers moving to Inland Empire customers do so under ocean carrier control. Under "store door" rates, the ocean carriers are responsible for delivering the container to final destination, usually by hiring a local drayage firm. The other options are "local" rates, in which the customer is responsible for movement from the port, and "inland point intermodal" (IPI) rates that incorporate a rail move on longer trips.

It is possible that ocean carriers could use a rail shuttle to deliver "store door" containers to customers in and beyond the Inland Empire. The ocean carriers could do so to save money, assuming the rail shuttle and subsequent short delivery drayage were priced below a pure truck move. Ocean carriers might also do so to obtain additional capacity when the fleet of drayage tractors and drivers was insufficient to deliver the full volume of import containers on a timely basis, such as in peak shipping season.

While the ocean carriers may theoretically have control over the "store door" movements, in practical terms the delivery arrangements must be acceptable to the import customer. For the largest, most influential customers the ocean carrier will tender the container to the customer's choice of drayman and pay the drayman's bill. Under those circumstances the customer would have to acquiesce in the shift from all-truck to rail shuttle. In all circumstances the rail shuttle/local delivery option must meet customer expectations for transit time, reliability, and damage control as well as cost.

The study team's discussions with ocean carriers were somewhat hampered by the conceptual state of the rail shuttle/inland port concept. Ocean carriers are generally interested in any opportunity to reduce cost and add capacity. They were, however, skeptical on several points.

- Some ocean carriers expressed doubts regarding railroad willingness to operate such a shuttle or allow others to operate it over railroad lines. These doubts must be acknowledged as realistic.

- Ocean carriers also expressed doubts about the timeliness and reliability of such a shuttle. On-time performance of rail intermodal service has varied over time depending on the railroad and the time period involved.

- Among all the parties contacted in the course of the study, ocean carriers were the most concerned that the International Longshore and Warehouse union (ILWU) might claim jurisdiction over an inland port. If that happened, the ocean carriers felt that costs would escalate due to ILWU wage rates and work rules.

Ocean carriers would be particularly unwilling to pursue the development of an inland port/rail shuttle combination before a new ILWU contract is negotiated. The current ILWU contract will expire in July 2008. Before then, the ocean carriers would be unwilling to do anything that might complicate or jeopardize the negotiations. This timing factor may have little practical impact since it is unlikely that a fully developed inland port/rail shuttle proposal would be ready during the negotiation period.

Study team contacts did reveal ocean carrier interest in a rail shuttle option, but the issue did not have high priority. Ocean carriers face numerous issues in serving Southern California, including container fees, cold-ironing, terminal capacity, and long-haul rail capacity – all of which are considered more pressing than the rail shuttle concept. One major ocean carrier had previously investigated the shuttle concept in detail, but chose not to pursue it.

Beyond the fear of ILWU jurisdiction there was no ocean carrier opposition to the concept. Ocean carriers are willing to use a shuttle if it can perform to their cost, timeliness, and reliability standards.

Drayage Industry Outlook

The ability of the ocean carriers and their customers to rely on conventional highway drayage to the Inland Empire is predicated on continued capacity and reasonable cost. At present, capacity is sufficient in all but peak season conditions. Drayage costs have risen in recent years with driver shortages, higher insurance costs, and rising fuel prices (the latter often covered by a surcharge). The increases, however, have been relatively minor and are not a cause for serious customer concern.

Under existing drayage industry conditions rates will continue to rise slowly for the foreseeable future and capacity will continue to tighten during seasonal peaks. PierPass implementation has allowed for a modest increase in the number of driver trips per day, and will continue to soften the impact of cargo growth. Under those circumstances drayage will remain a concern but is unlikely to experience a near-term crisis.

Those conditions, however, are going to change. Regional and community concerns over emissions have led the Ports to develop the Clean Air Action Plan (CAAP). A cornerstone of this broad, ambitious plan to reduce port-area emissions is the Clean Truck Program, a controversial effort to replace the oldest and most polluting drayage tractors with newer or retrofitted units.

The current plan is embodied in changes to the Port tariffs approved by the commissions of both Ports in early 2008. Those plans call for a progressive ban on older or non-retrofitted trucks. The cost of industry compliance with this plan will be substantial. The Ports are developing a plan to subsidize a large portion of the cost of new or retrofitted tractors. To do so, however, the ports will draw on the same funding sources that might otherwise support a rail shuttle – state infrastructure bonds, congestion and air quality mitigation funds, and container fees. The more successful the Ports are in assembling funds for new drayage tractors, the less the chances of funding an inland port/rail shuttle project.

The remaining financial burden of the CTP will fall on the drayage industry and its customers. Some drayage tractors will be withdrawn from service and not replaced, possibly reducing net fleet capacity.

A second event affecting Inland Empire drayage costs and capacities is implementation of the Homeland Security Transportation Workers Identification Card (TWIC) program. This program, due to be implemented in Southern California beginning in December 2007, requires port drayage drivers (among many others) to pay a fee and submit documentation to obtain the TWIC. While the TWIC requirements cover criminal corrections and other issues ,the biggest impact on the drayage industry will be elimination of many illegal aliens from the driver pool. Immigrants of all kinds account for a very large percentage of all port drayage drivers and it is estimated that up to 20% will either fail to obtain a TWIC or choose to leave the field rather than apply (likelier for illegal aliens).

Reduced capacity and higher drayage rates would lead to greater interest in an inland port/rail shuttle alternative. The costs of local drayage within the Inland Empire would likely rise as well, but neither the CTP or the TWIC program would have a direct impact on them.

A loss of 20% of the driver pool would cut regional drayage capacity by the same amount (assuming that the loss was uniform across the range of full-time, part-time, and occasional port drivers). The loss would not be critical in the slack import months of December 2007 through February 2008, but would begin to hamper port operations as imports rose in the spring of 2008. If the industry does indeed lose 20% of its drivers and cannot replace those drivers by July 2008 when the peak shipping season begins, there will be an acute shortfall.

A study commissioned by the Ports[6] found that the combined impact of TWIC and the most aggressive proposals in the Clean Truck Program could increase the cost of drayage to the Inland Empire from $300 to as much as $540 per trip, as discussed early in the cost comparisons. Such a large increase could materially change the rail/truck cost comparisons and materially reduce the need for an operating subsidy.

These drayage outlook considerations pose a dilemma for the inland port/rail shuttle concept. By any criteria, large-scale emissions reduction in the immediate port area is a higher regional priority than the rail shuttle. Public support for such emissions reduction strategies will drain resources that might otherwise have supported a rail shuttle. To the extent that drayage costs and rates rise as a result of these programs the truck/shuttle cost gap will narrow and subsidy needs will decline.

A drayage capacity shortfall would increase demand for a rail shuttle, yet that increased demand would likely be restricted to peak season and the rail shuttle could offset only part of the shortfall. An inland port/rail shuttle cannot, therefore, be considered more than a partial remedy for CTP impacts.

The prospect of substantial drayage cost increases and capacity shortfalls does suggest that future distribution center developments cannot rely on cheap abundant trucking to and from the ports. This observation suggests in turn that it would be prudent to consider a rail shuttle alternative in planning for concentrations of distribution activity beyond the central Inland Empire.

[6] San Pedro Bay Ports Clean Air Action Plan, Economic Analysis; Husing, Brightbell, and Crosby, September 2007

Appendix: Preliminary Analysis of Innovative Container Transport Systems

Background

Movement of marine containers between marine ports and nearby inland sites is widely recognized as a potential problem. Multiple authors have cited growing highway and rail congestion in Southern California as a preamble to proposed solutions. The efficiency and capacity of the transportation linkage to the seaport is a critical factor in the feasibility of an inland port, so the project team reviewed several innovative linkage proposals.

These technology descriptions are based on materials and documents available in mid-2006. Many of these concepts have evolved since 2006, and this information is being updated in other studies now in progress (as of June 2008).

Proposed Container Transport Systems

The Study Team has identified several marine container transport systems proposed for application to Southern California ports. More proposals may exist, but are likely to be variations on those listed below.

Linear Induction Motor Systems

Liner induction motor (LIM) systems typically use a girder-like monorail to support or suspend a container-carrying vehicle. Linear induction motors use electromagnetic force to produce linear mechanical force, rather than torque as in typical rotary electric motors. Vehicles that use linear induction motors can have contact with the guideway through the wheels (they may also levitate on the cushion of air between magnets mounted on the guideway and others on the vehicle, often referred to as “magnetic levitation” or “maglev” technology). LIM allows for a very simple electric propulsion system with few moving parts.

Freight Shuttle. One LIM concept, called the *“Freight Shuttle”*[7], consists of an automated vehicle, a specially designed guideway, a linear induction propulsion system, and a control system (Exhibit 64). This system, like all the others discussed here, is envisioned as fully automated and unmanned, shifting the complexity to the central control system.

[7] *The Freight Shuttle: The Crisis in Freight Transportation and The Opportunity for a Green Alternative*, Stephen S. Roop, Ph.D., Texas Transportation Institute, Texas A&M University, 2006

Exhibit 64: Freight Shuttle LIM System

Note that Exhibit 64 shows the Freight Shuttle guideway at ground level in the marine or inland terminal. Fixed girder-like guideways have the disadvantage of presenting a barrier to terminal circulation.

The Freight Shuttle concept requires an exclusive, grade-separated right-of-way as it is not compatible with other systems or with driver-guided vehicles. Exhibit 65 shows the Freight Shuttle in a freeway median, a common concept for fixed-guideway systems. Exhibit 64 shows the floor of the Freight Shuttle vehicle to be approximately the same height as a container chassis. If so, it should fit under freeway and surface overpasses.

Exhibit 65: Freight Shuttle in Freeway Median

The Freight Shuttle is envisioned as running in a loop between a marine terminal and an inland terminal.

Auto-GO. Titan Global Technologies Ltd., a New Jersey based company, developed a suspended freight monorail concept that utilizes linear induction motors called Auto-GO**.** Auto-GO is an overhead cargo container handling system with fully automated single-container shuttles using linear induction motors (Exhibit 66). The Auto-GO system envisions container vehicles suspended from a girder system, each vehicle equipped with a spreader bar and cables to lift and drop containers at the terminals. This system would also be fully automated.

Exhibit 66: Auto-GO System over Highway

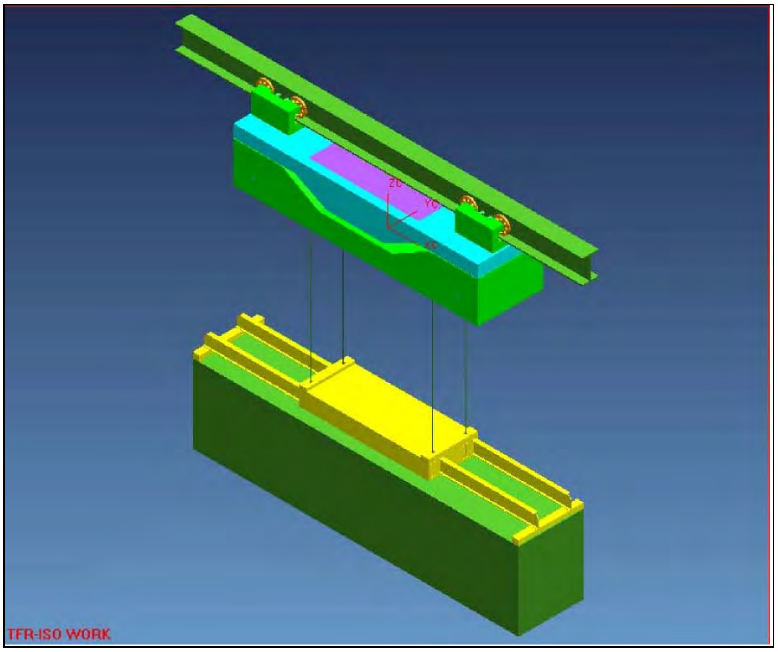
The transportation process would start inside the terminal where a gantry crane drops off the container (Exhibit 67). A cargo carrying system that is integrated with the carrying vehicle picks up the container and raises it by means of a specially designed bogie-spreader bar combination. The container is then secured under the container shuttle, and transported at 50 to 75 mph to its final destination.

Exhibit 67: Auto-GO System in Terminal

Titan has built and tested a scale model of the Auto-GO system. The technologies used in the Auto-GO system guideway, switches, and movement control system, have been tested in the field and use of linear induction motors have been proven in operation of the monorail people-movers that Titan built in Miami, Florida; Pomona, California; and Dallas, Texas.

Grail. An Illinois Institute of Technology team developed a conceptual intra-yard GRail (Grid-Rail) system that utilizes linear induction motor technology. (Exhibit 68)

Exhibit 68: GRID Rail (GRAIL) Concept



Much of this concept was developed over a period for Sea-Land Corporation by August Design, Inc., originally for ship-to-shore application, and was not widely documented until 2000. Exhibit 69 shows the elevated Grail grid structure, similar to the Auto-GO concept shown in Exhibit 67.

The team also designed an elevated structure to move containers between terminals using a LIM vehicle. This between-yard structure provides for connecting freight nodes and allows for expansion capability by providing space for the under-hung GRail shuttle (Exhibit 70).

Exhibit 69: GRAIL Terminal Grid Structure

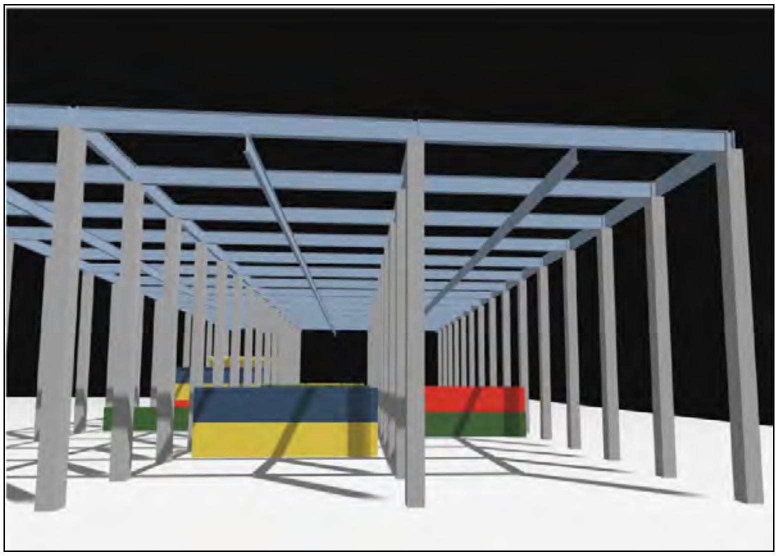
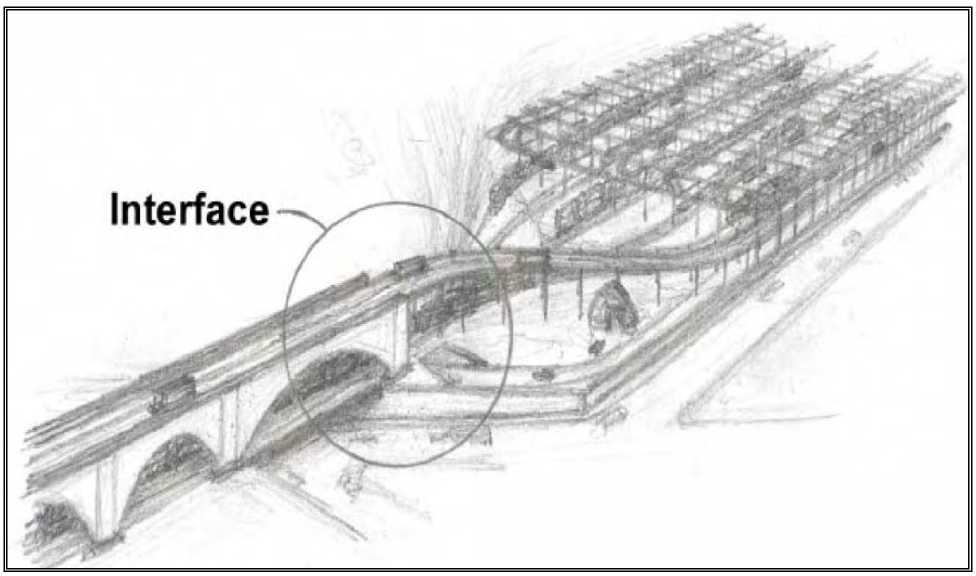


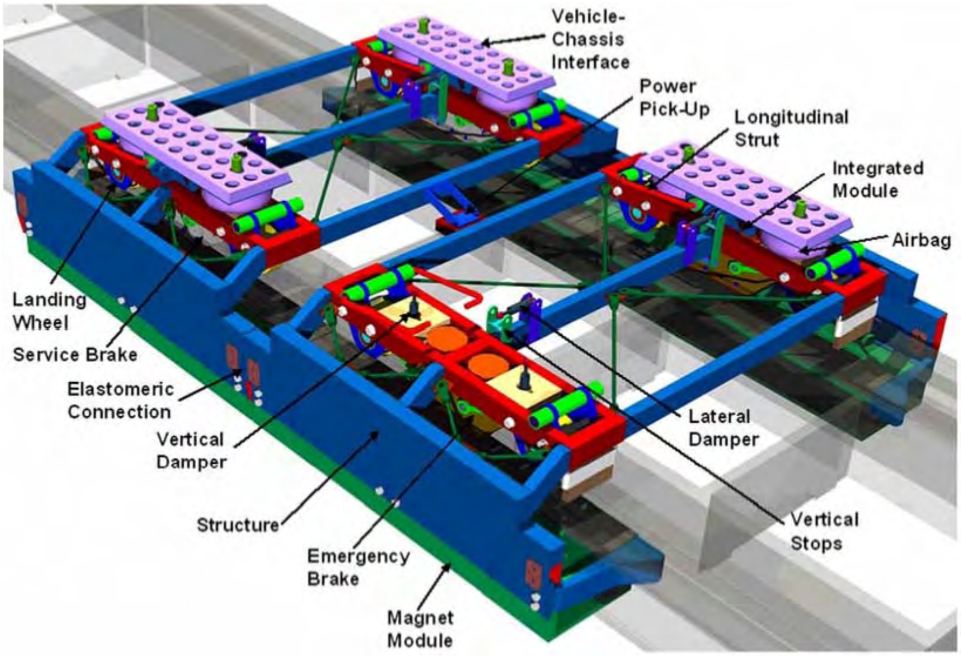
Exhibit 70: GRail Transition Structure



Maglev Systems

By adding magnetic levitation to LIM propulsion, Maglev proposals offer reduced friction, reduced noise, and higher speeds (Exhibit 71). These systems are also envisioned as fully automated. TransRapid International (a joint venture between Siemens and Thyssen-Krupp) is perhaps the farthest along in developing a Maglev container transport concept.

Exhibit 71: Detailed View of General Atomic's EDS Maglev Design



TransRapid's analysis (not verified by the study team) contends that a Maglev container system would have similar capital costs and lower operational costs than highway or rail (TransRapid, 2004). The analysis envisions a dedicated express container system connecting the ports to the Inland Empire, to Victorville, and to Beaumont, with capacity for five million containers per year.

CCDoTT considered a number of rights-of-way as shown on the map in Exhibit 72. Perhaps the most promising route is the one that follows I-15 through the Cajon pass. Proponents of Maglev freight systems cite their ability to climb steep grades. The freight Maglev system is projected to be able to carry containers up a 6% grade, versus 3% for conventional rail. The 6% claimed maximum grade for freight Maglev matches the maximum grade on Interstate highways, suggesting Maglev rights-of-way along interstate medians (assuming such medians are available).

Exhibit 72: TransRapid Maglev Route Proposals

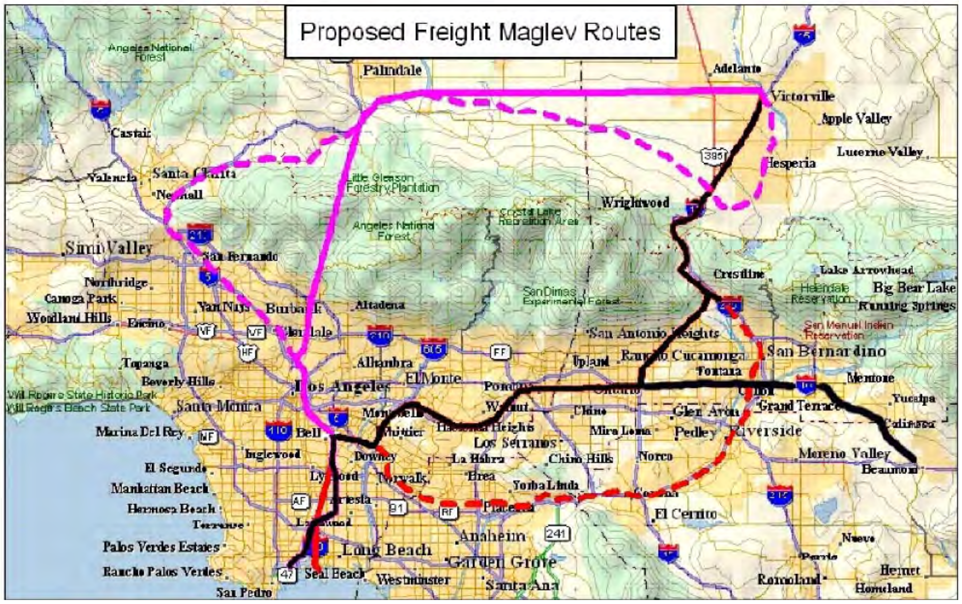
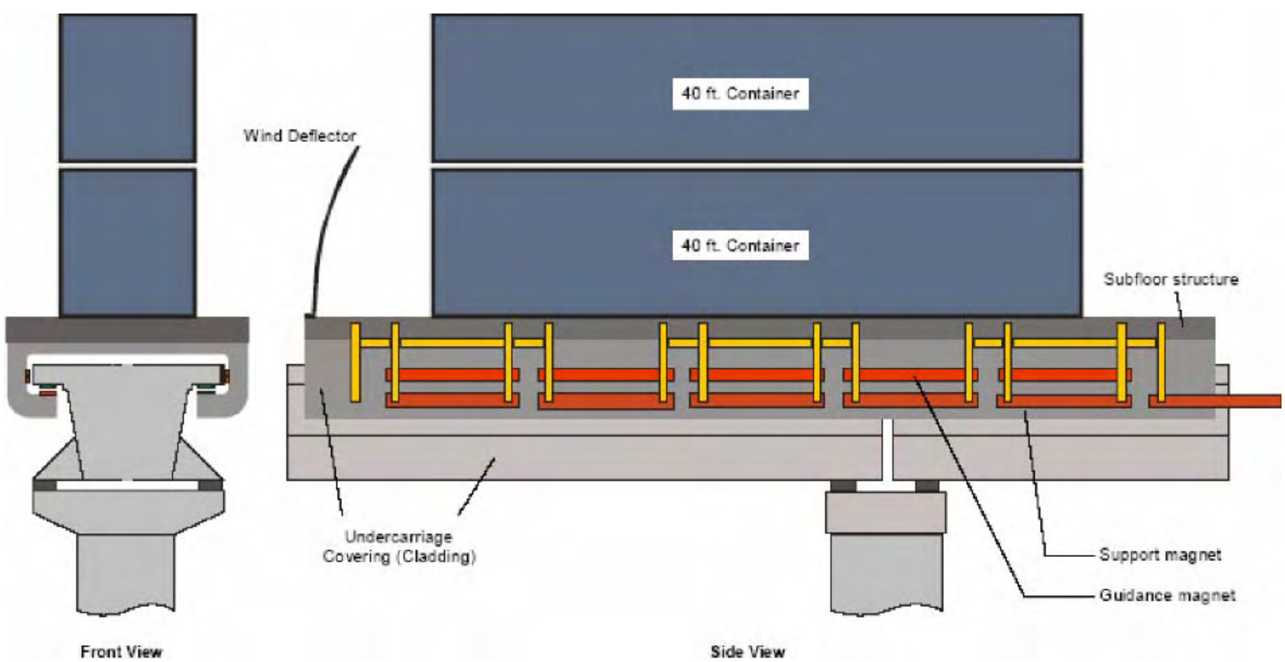


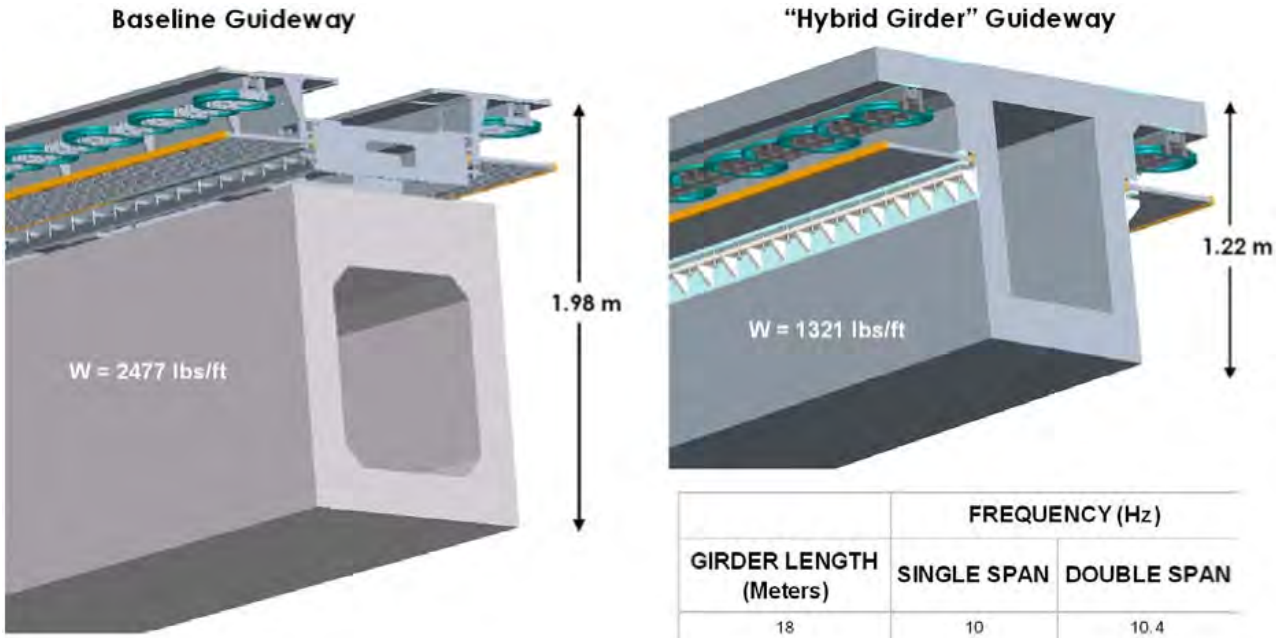
Exhibit 73 shows the TransRapid freight design in a double-stack configuration.

Exhibit 73: TransRapid Maglev Concept



The combined height of guideway (Exhibit 74), vehicles (Exhibit 71) and two high-cube (9'6") containers would be 25' – 27'. A double-stack Maglev system would not fit under Interstate overpasses. A single-stack Maglev system would be 15' – 17' high, and would have to be depressed in the median to fit under most freeway overpasses.

Exhibit 74: TransRapid Maglev Guideway Concepts

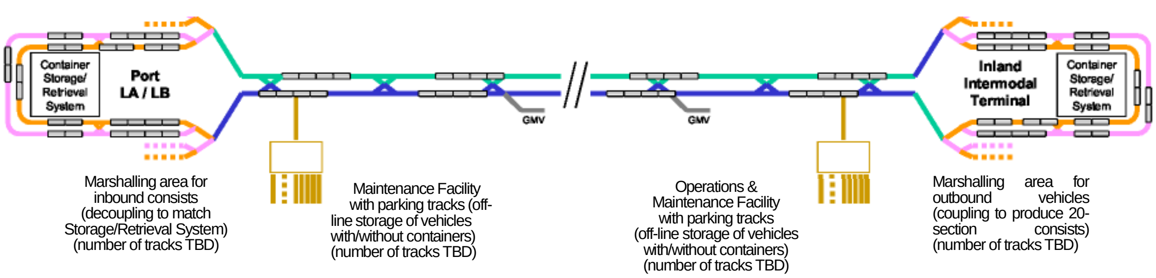


GIRDER LENGTH (Meters)	FREQUENCY (Hz)	
	SINGLE SPAN	DOUBLE SPAN
18	10	10.4
24	5.67	5.92
30	3.45	3.87
36	2.52	2.61

Exhibit 75 shows a conceptual Maglev system linking a single port terminal with an inland terminal. The design shows two-unit and four-unit Maglev vehicles, instead of the single vehicles in most system proposals. The diagram also reflects the need for crossovers, maintenance facilities, and storage facilities ignored by other, less detailed proposals.

The terminals shown in Exhibit 75 include marshalling areas and "container storage/retrieval systems". Note that only one port terminal and only one terminal are shown. The system complexity would increase dramatically if the system were to serve multiple terminals on each end.

Exhibit 75: TransRapid's Port to Inland Intermodal Layout



In common with the other fixed-guideway proposals the Maglev system may require completely rebuilding or replacing existing marine terminals. Exhibit 76 shows a terminal concept developed by TransRapid. The automatic container storage/retrieval system has not been designed. Although several concepts have been developed by other authors for similar systems, none have been designed in detail or built. Each terminal served by the Maglev system would need a comparable system.

Exhibit 76: Maglev Terminal Concept

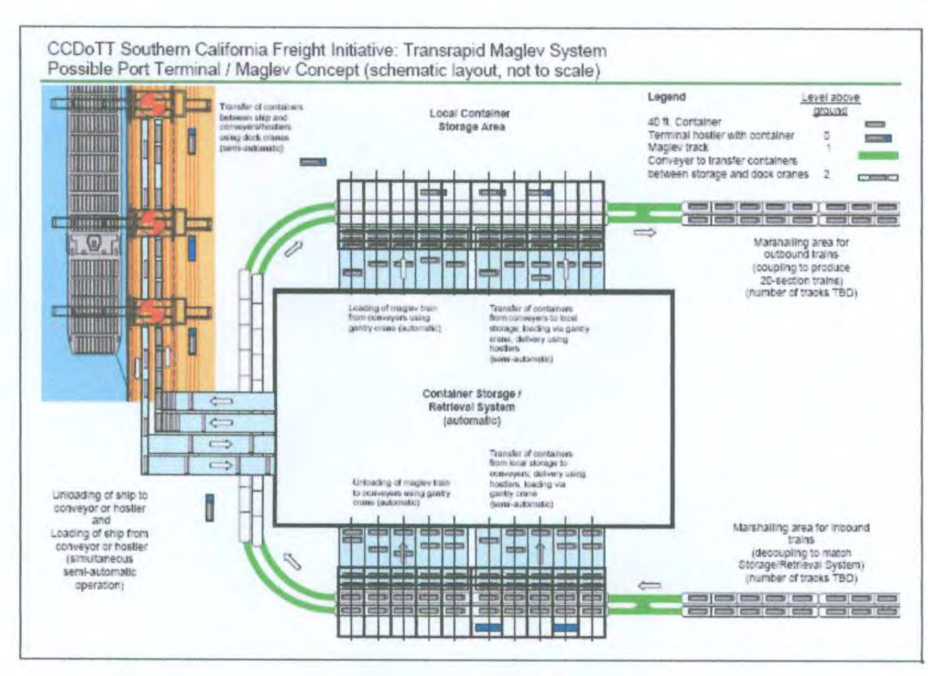
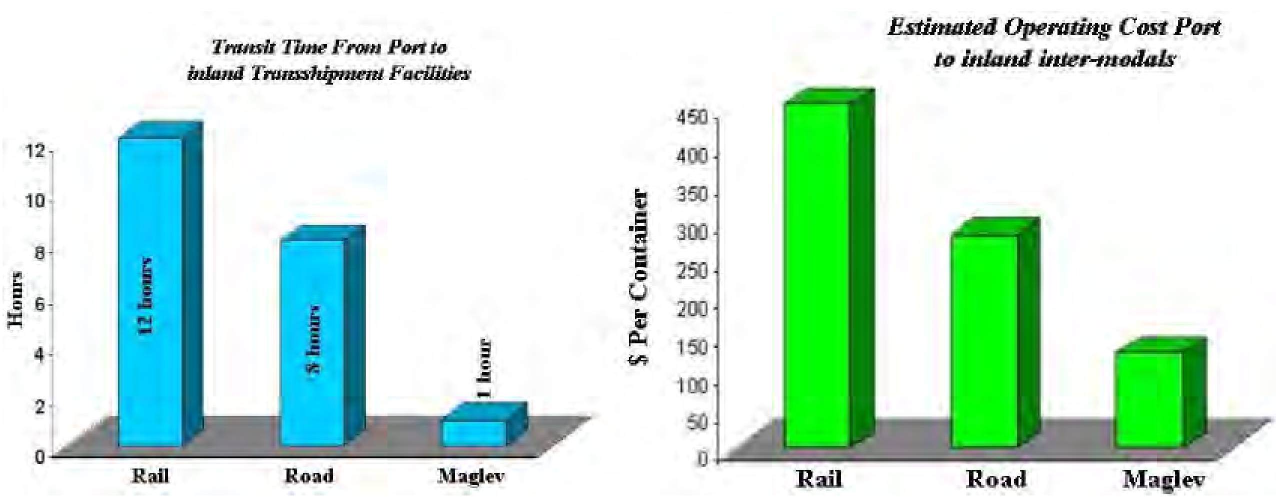


Exhibit 77 shows proponents' estimates of relative transit times and operating costs for a 100-mile trip (not verified by the study team, and inconsistent with other information).

Exhibit 77: Proponents' 100-mile Transit Time and Cost Estimates (unverified)

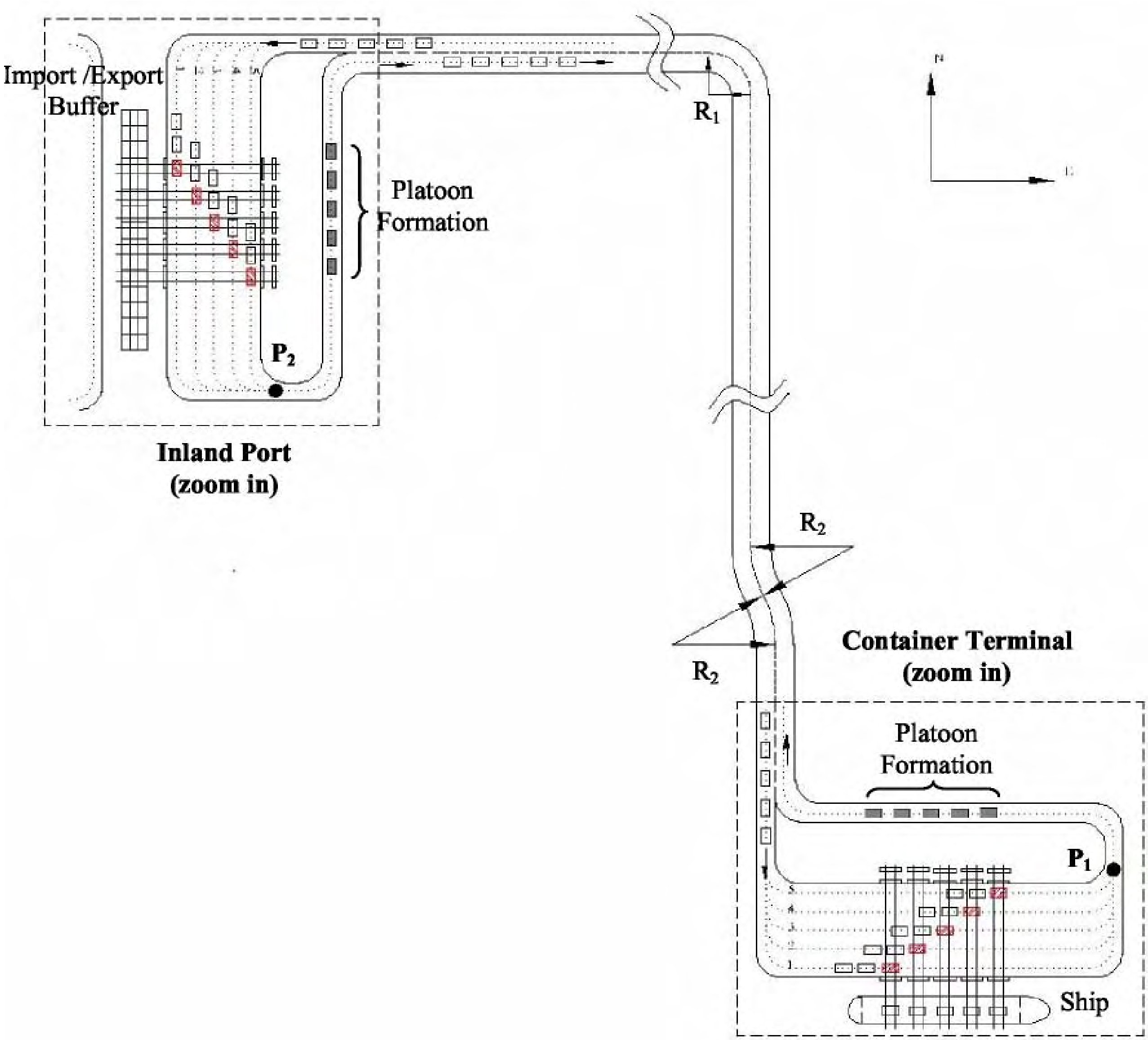


California State University is conducting a study on the engineering design and subsequent cost of the General Atomics (EDS) approach for container freight movement at the Ports. The EDS Maglev design will be projected onto the Port of Los Angeles / Long Beach / Alameda Corridor infrastructure to determine its feasibility as a means of transporting containers from the Port's terminals to the (ICTF) at the Alameda Corridor (Gurol, 2005).

Automated Truck Platoons

Another approach calls for groups of remote controlled, automated trucks traveling on exclusive roads. The proposed system (Exhibit 78) includes reconfigured marine and inland terminals with automated multi-lane cranes.

Exhibit 78: Conceptual Automated Truck Platoon System



Automated guided vehicles (AGVs) have been proposed and studied in several instances. The Delta Terminal at the Port of Rotterdam has been operating AGVs to transport containers within the terminal, while other European and Asian ports are reportedly experimenting with similar systems.

The system proposed for port to inland trip is much more ambitious. Since the automated trucks required to transport containers between a port and an inland port some distance away, they will need to travel at much higher speeds than the AGVs operating inside container terminals. The

Center of Transport Technology in the Netherlands studied a container transport system, called "Combi-Road", in which each container is pulled on a semi-trailer of an unmanned vehicle, and the vehicles are electrically driven along specially designed tracks. The proposed system, shown in Ex 9, is composed of automated trucks, automated cranes and a central control system. The central system would contain all the information on transportation tasks and road geometry, acquire real time information, and issue commands for all the trucks, cranes, etc.

Automated trucks would transport containers on a dedicated road. Inside the terminals containers would be handled by automated cranes. An automated truck would be issued commands for carrying a container from the inland port, joining a platoon, speeding up to a desired speed, cruising while on the road, slowing down when entering the container terminal, positioning itself under a quay crane for unloading, then repeating the cycle.

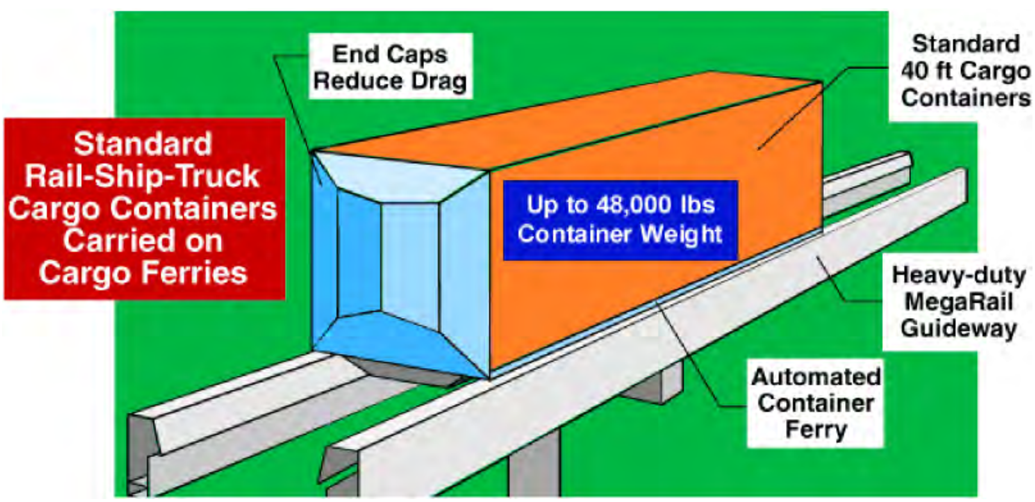
In common with other systems relying on agile port operations, all the import containers would be transported to the inland port before they are distributed to different destinations, and all the export containers would be processed in the inland port before they are transferred to the container terminal.

At the moment this system is strictly conceptual. Simulations of its performance connecting one marine terminal to one inland port have been conducted, but none of the equipment has been designed or demonstrated and more complex multi-terminal operations have not yet been addressed.

Automated Rail Vehicles.

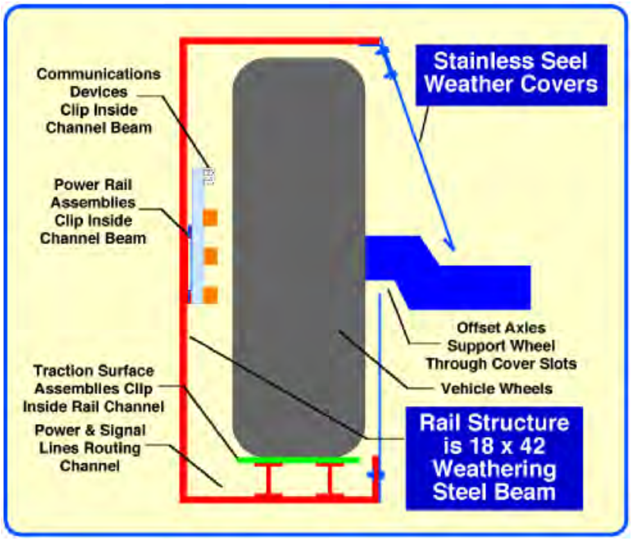
CargoRail. The CargoRail concept developed by the MegaRail Transportation Systems, Inc. employs rubber-tired vehicles (referred to as "Cargo Ferries") that would move along an exclusive elevated guideway (Exhibit 79).

Exhibit 79: CargoRail System



Each vehicle would operate individually, but would be fully automated and centrally controlled. Vehicles would operate on an enclosed weatherproof guideway (Exhibit 80).

Exhibit 80: CargoRail Guideway Concept



MegaRail Transportation Systems claims that this system is ready for a non-stop, 24-hour, 7-day a week operation at operational speeds of up to 75 mph. The maximum designed payload per vehicle is 50,000 lbs. This proposal appears to be derived from MegaRails' similar proposals for people movers.

CargoMover. Another proposal calls for automated vehicles operating over conventional railroad tracks, each carrying a single container. (Exhibit 81) A variation on this proposal would equip each vehicle to load or unload itself. CargoMover technology is designed to utilize European rail and wireless control systems. These systems are currently being deployed on several railway systems in Western Europe. CargoMover can also operate in conjunction with other train control systems. Siemens is currently testing several CargoMover vehicles.

Exhibit 81: Siemans Transportation CargoMover

Commonalities

As proposed these systems have several major features in common.

Agile Port Operations

Explicitly or implicitly all of the candidate concepts assume "agile port" operations, which were discussed in detail in the Task 1-2 report. While the "agile port" concept is subject to many interpretations, the core of the concept is transfer of unsorted inland containers from vessel to an inland point where sorting takes place. The objective of agile port operations is to dramatically reduce container dwell time at seaport terminals and thereby increase their throughput capacity with the same acreage.

It is unclear how critical agile port operations are to the design of the various systems. The technical transportation functions would appear to work equally well with sorted or unsorted containers. It is possible, however, that the ability to load and unload these systems expeditiously might be compromised by the need to sort containers at either end of the trip. Continuous loop systems do not cope well with vehicles that make different stops for different time periods. The capability of these systems to accommodate varying operating schemes needs further investigation.

If the efficiency of these systems depends critically on agile port operations, then their feasibility depends on the ability of ocean carriers, terminal operators, and the marine and inland terminals themselves to implement agile port operations. This is not a trivial question, as terminal infrastructure, terminal operating systems, vessel loading practices, vessel deployments, labor contracts and manning, and financial provisions would all have to change.

Terminal land requirements for intermodal operations of any kind are determined by peak-period throughput and dwell time. For agile port operations to reduce marine terminal dwell time they must provide substitute storage and buffer space inland. Greater reductions in marine terminal dwell time will require larger inland terminals.

Unmanned, automated vehicles.

All of the systems are planned to be completely automated, with unmanned vehicles controlled by a central computer system. Such systems are typically used in "people movers" in airports and other facilities. Transit systems with central control (e.g. BART) have operators on board with manual control options. While transit and people mover experience suggests that unmanned vehicles can be successfully controlled in uniform, closed-loop operations, the ability of such systems to cope with the complexity of multi-node systems or complex repositioning moves within terminals remains to be demonstrated. Likewise, the experience with localized people mover systems may not be translatable to distances of 60 – 100 miles between the ports and an inland terminal.

Exclusive grade-separated right-of-way

The most fundamental issue with all of these proposals is the requirement for an exclusive, grade-separated right-of-way. For most proposals (LIM, Maglev, automated rail vehicles) the required right-of-way would be the equivalent of a double-track surface or elevated railroad. The automated truck proposal would require the equivalent of a 2-3 lane highway.

Exclusive, grade-separated rights-of-way between the ports and inland terminals are arguably the scarcest resources in Southern California. As the study teams working on additional I-710 capacity and truck lanes have learned, right-of-way expansion through populated areas is a daunting task. None of the proposals suggest actual Southern California alignments.

Were potential exclusive, grade-separated available for surface LIM or Maglev systems they would also be available for conventional rail or truck operations, and the available proposals do not yet demonstrate that the innovative systems can provide greater throughput capacity then conventional systems.

Most proposed systems can be supported on pylons, like elevated rail transit systems. This feature does give some locational flexibility, but presents problems when confronted with other elevated structures in the alignment, particularly freeway overpasses. Community opposition to elevated systems is likely to be vehement and pervasive. The height of marine containers would make elevated container systems taller, more obtrusive, and more objectionable to residential and commercial neighborhoods than passenger systems. Marine containers are also sometimes visually unattractive. Finally, any proposal to move unmanned container vehicles over or through communities of any kind will have to address the potential for hazardous cargoes (e.g. chemicals or explosives) or objectionable cargoes (e.g. recyclables, animal hides).

Standard vertical clearances for interstate highways in urban areas is 14 feet, with a goal of providing at least one route option with 16 feet of clearance (the standard for rural interstates). The standard maximum height for a highway trailer or container/chassis combination is 13’6”. With 9’6” high-cube containers being very common and the norm for many transpacific imports, the guideway and vehicle combinations are effectively limited to a height of 4’ to bring the total within the 14’ interstate clearance limit. This limitation may require either redesign of some systems or depressed installations.

The various elevated fixed-guideway systems would need to be about 29’ to 30’ high to accommodate single-high 9’ 6” high-cube containers and provide 14’ of vertical clearance underneath to pass over another highway or road.

As noted elsewhere, elevated systems could not share the Alameda Corridor right-of-way. The Alameda Corridor is built with 24’8” clearances for eventual electrification above double-stack trains. Double-stack trains require 21’ – 22’ of vertical clearance. There is no possibility of squeezing elevated systems into the corridor with conventional double-stack trains.

Some Maglev proposal also contemplate double-stacked containers. An elevated Maglev system with double-stacked high-cube containers would be about 39’ tall, the equivalent of a 4 – 5 story building. A surface Maglev system with double-stacked containers would be about 25’ tall, too tall for either interstate overpasses or the Alameda Corridor.

None of the proposals, except the Maglev report, give construction cost estimates.

Potential Benefits

The proposed systems all claim essentially the same benefits.

Increased throughput capacity free of road and rail congestion

If each system operated as imagined, they would indeed expand total capacity independent of roads or railroads. Note, however, that right-of-way and terminal access used for these systems must be withdrawn from potential use by other modes. Capacity is discussed further below.

Reduced emissions and energy use through electric propulsion (except the automated diesel rail vehicles)

This would likewise be a valid benefit if the systems prove feasible. The same benefit could be obtained, however, by electrifying existing rail operations. The Alameda Corridor was built with sufficient clearances for subsequent electrification.

Low operating costs through automation and efficiency

None of the proposals, however, offer estimates of actual operating costs. As noted below, a full consideration of costs is much more complex than most technology proposals suggest.

Security

All the proposals claim improvements in security by operating on exclusive, grade-separated rights-of-way. None of the proposals, however, include a security assessment, and it is inherently difficult to secure dispersed unmanned systems.

Open Questions

Vulnerability to disruption

A fundamental disadvantage of automated, unmanned systems on exclusive guideways is their vulnerability to service failures and disruption. Without the ability to operate in a manual fall-back mode and isolated from other systems, the ability of an automated guideway system to recover from vehicle, systems, or guideway failures is extremely limited.

Failure of the central or propulsion systems on a single vehicle could bring LIM, Maglev, and similar systems to a halt, if there is no means to bypass or remove a stalled vehicle. Accidental or intentional guideway damage would likewise halt the system completely. In this respect, unmanned systems have a very high exposure to vandalism or terrorist attempts to disrupt the port system.

An unmanned system is obviously vulnerable to central control failure. While redundant and robust systems offer some protection, the complexity of a real-world, automated vehicle control system of the imagined scale implies less-than-perfect reliability. The Maglev system anticipates capacities of 16,000 one-way vehicle trips per day. At half capacity (8,000 trips per day) and 99.99% reliability, 8 failures per day could be expected.

Some proposals contemplate guideway systems with crossovers and other features to improve reliability. These features may reduce the vulnerability to vehicle or guideway failures, but they do not affect the risk of system failure and they can add substantially to the cost.

Lack of Gathering and Distribution Ability

All of the automated system proposals are presented as point-to-point linkages from a single marine terminal to a single inland point. The Port of Long Beach and Los Angeles, in contrast, consist of fourteen container terminals scattered over a 20- mile waterfront and separated by water, highway, rail, utility, and development barriers. None of the proposals to date address the challenge of transitioning from a closed loop linkage between two points and a multi-mode network across natural and man-made barriers. Connectivity between marine terminals and the ability to assemble and distribute trains across multiple terminals is already a challenge for Pacific Harbor Lines and a limiting factor in the growth of on-dock rail. Overlaying a new fixed-guideway gathering and distribution system would be a Herculean task.

Absent direct access to terminals, a fixed guideway system would require a port-area marshalling terminal with drayage to and from the marine terminals. This requirement would defeat the economics and the purpose of the proposed systems.

Marine Terminal Intrusion

All of the proposed systems, if given direct access to the marine terminal, would require substantial reconfiguration of the terminal itself. Different system presences in marine and inland terminals can be seen in Exhibit 64, Exhibit 67, Exhibit 69, Exhibit 76, and Exhibit 78.

On-dock rail facilities are normally sited at the rear or margin of marine terminals to avoid interference with routine terminal operations, specifically loading and unloading the vessel. The various automated systems would need to be similarly situated. Drawings showing convenient direct-to-vessel transfers typically ignore the large volume of containers that must be transferred to truck for local delivery. Raised guideway systems pose a particular problem for direct vessel transfer as they would create a physical barrier between the vessel and the rest of the terminal.

Dedicating space for a new fixed guideway interchange will necessarily reduce the net terminal acreage available for handling and storage.

More fundamentally, most of the automated systems rely on automated marine and inland terminals that currently exist only in concept. There is an inherent challenge in designing a ground level terminal for vessels and trucks that can also efficiently load and unload large volumes of containers from an elevated system. The throughputs envisioned for the Maglev system of 400 containers per hour must be viewed in the light of conventional container unloading and loading cycles of 20 per hour per lift machine, implying a need for up to 20 lift machines operating simultaneously to keep up with the Maglev throughput.

All of these considerations imply that marine and inland terminals will need to be reinvented and completely rebuilt or replaced before such transport systems can reach their potential.

Capacity

None of the proposals reviewed, except the Maglev report, provide working capacity estimates (e.g. containers per hour). Capacity is more than a function of speed and transit time. All of the rail systems anticipate multiple single-container vehicles on a closed loop, with the implications of real-time loading and unloading.

If the time required to unload and reload a vehicle is more than the safe headway between them, vehicles will have to queue up at the terminals. It typically requires an absolute minimum of five minutes to unload and reload a container from a rail car if the containers are pre-staged. An average time would be closer to ten minutes to allow for the unloaded container to be taken away and a second container positioned for loading. By this line of reasoning, either the system is limited to ten-minute headways or a significant amount of time must be allowed for queuing at both terminals.

- Dispatching single-container vehicles on ten-minute headways would yield a throughput of only 6 containers per hour.
- One-minute headways would yield a guideway throughput of 60 containers per hour, but could result in large queues for loading and unloading at each terminal.
- Thirty-second headways would increase the guideway throughput to 120 containers per hour, but containers would arrive much faster than they could be unloaded and reloaded to return.
- By comparison, a single highway lane has a nominal throughout capacity of about 1500 vehicles per hour.

Loading containers only one way would speed up the terminal operation but increase the operating costs and reduce the efficiency.

Operating Cost

All of the proposed systems claim lower operating costs than conventional rail or truck. Only one proposal, however, offers any numeric comparisons. Those comparisons lack detail and would require considerable analysis to verify..

The claims of lower operating cost are based on low energy use and unmanned operation. For example:

Projections for the energy requirements of the Freight Shuttle in Southern California setting suggest that, at current PG&E electrical rates, a 60-mile transit would cost roughly $20 in power use – the only variable cost in the Freight Shuttle cost structure – far lower than the variable costs associated with trucking.[8]

Unfortunately, such statements ignore the complexities. A full accounting would need to address:

[8] Roop, 2006

- System control operations and labor
- Energy costs
- Equipment and guideway maintenance cost.
- Terminal labor and systems cost
- Lift-on and lift-off costs (typically $30 to $40 per lift, or $120 to $160 for a round trip with one container each way)

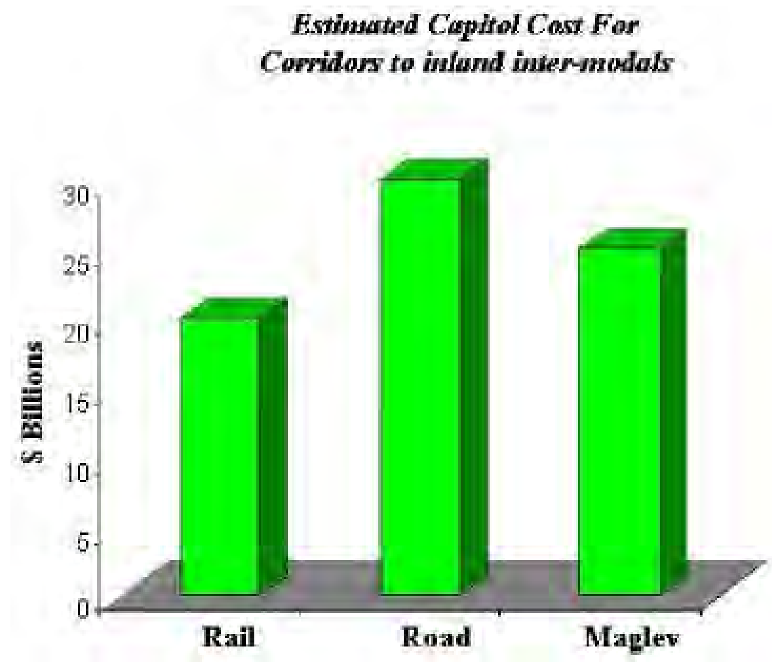
Capital Cost

Few of the proposals give any indication of capital costs. There are a number of concerns.

- While the proposals make plausible claims that the fixed guideway will be inexpensive to construct, there is no working experience to draw from and no estimates are given.
- None of these are commercial off-the-shelf ("COTS") systems and their cost is unknown. The proposed vehicles vary considerably in complexity, and only one (the automated CargoMover rail vehicle) exists in prototype. The LIM propulsion system requires almost no moving parts, but some of the vehicles have complex suspension, loading, unloading, or sensor systems (Exhibit 71, Exhibit 68)
- The capital costs to replace the marine and inland terminals with automated systems are likewise unknown.
- All of the systems incorporate elaborate automated control of unmanned vehicles. The cost of the vehicle control system components is unknown, and only one prototype exists.
- Perhaps the greatest unknown is the cost of acquiring and assembling the exclusive, grade-separated right-of-way through neighboring cities.

The maglev proposal gives the capital cost comparison shown in Exhibit 82. Without any detail, however, it is not possible to evaluate the estimates. In the graph, however, it does appear that the maglev system is expected to cost at least $5 billion more than a conventional rail system of the same incremental capacity. Terminal costs are apparently not included.

Exhibit 82: Maglev Proponents' Estimated Capital Costs to Carry an Additional 5+ Million Annual Containers (unverified)



Applicability to Southern California Inland Ports

As a practical means of connecting an inland port complex with marine container terminals in Long Beach and Los Angeles, these systems must be regarded as highly speculative at this point in their development.

All of these systems appear better suited to connecting a single large multi-user marine terminal with a single inland satellite terminal. This arrangement would be much more common in Europe or Asia than in North America. Were such a new terminal contemplated in Los Angeles or Long Beach, a successful automated system might be suitable to connect that terminal with an inland point in agile port operations.

These proposed systems would require substantially more detailed analysis before they could be considered as serious candidates for implementation.

Most critically, the availability or feasibility of an exclusive, grade-separated right-of-way must be firmly established. If the required right-of-way is not feasible, the technical merits of the proposed systems are irrelevant.

Need for Complete System Designs

None of the proposals reviewed to date describe a complete system.

- The Maglev system is the most advanced in its design but the terminals are conceptual "black boxes" at this point.

- The automated truck platoon system is “complete” in that the performance of conceptual terminal systems has been modeled, but no engineering or operational design has taken place.
- None of the proposals have identified a feasible right-of-way or addressed the complexity of serving multiple port terminals.

A complete system design would need to address each step of the port-to-destination movement.

1. **How are containers moved from vessel to system loading point (and vice versa)?** At present, every container in North America is moved on chassis between the apron under the crane and the container yard or on-dock rail terminal.
2. **How are containers loaded and unloaded to/from system vehicles?** At present, marine terminals in North America use gantry cranes, side loaders, reach stackers, or straddle carriers to handle containers or chassis, on rail cars, or on the ground.
3. **How does the system get into, through, and out of the marine (and inland) terminal?** Conventional rail tracks embedded in pavement allow trucks to pass over. No terminals have rail loading at ship side.
4. **How does the system link multiple marine and/or inland terminals?** As noted elsewhere, the Los Angeles and Long Beach terminals are scattered over 20 square miles of waterfront and separated by water, highway, rail, and development barriers.
5. **What right-of-way does the system use to link terminals?** Absent a feasible right-of-way other system features are irrelevant.
6. **How are system movements planned and controlled?** The system must correctly identify each container, move it to the correct terminal, position it for loading/unloading, and hand-off control to terminal gate (inland) or vessel (marine) systems.
7. **How does the system recover from disruptions?** The full range of potential disruptions might include vehicle failure or malfunction; central system failure or error; guideway failure or damage; power shortage or loss; and accidental or malicious damage.
8. **Where will import containers be sorted and forwarded to final destination by truck or rail?** The agile port concept on which all the systems implicitly rely shifts the sorting function to the inland terminal. The inland terminal must be sized, planned, equipped, and operated accordingly.
9. **What are the full capital costs of the system?** The capital costs must encompass the right-of-way, the guideway, the vehicles, the control system, the terminals, and any ancillary facilities or systems.

10. **What are the full vessel-to-destination operating costs?** The operating cost estimates would have to include every step: unloading the vessel, operating the terminals, loading and unloading, sorting, linehaul, transfer to another mode, overhead, etc.

11. **What is the system throughput capability?** The system will be limited by its slowest link, which is likely to be in the terminals rather than on the line-haul. The system will need to cope with volume peaks and valleys, and comparisons should be based on reliable, day-in/day-out throughput rather than optimized conditions.

12. **What impact will the system have on communities, highways, and other urban features?** The existing proposals point out the potential emissions advantages but do not discuss the potential neighborhood division and diminished property values associated with elevated systems, displacement of truck drivers, or exposure to hazardous/objectionable cargo.

As most of the proposed systems are highly conceptual, there is a long way to go before these systems can be evaluated with any confidence.

Sources

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